U.S. Department of the Interior
Bureau of Land Management
Wyoming State Office

Rawlins and Rock Springs Field Offices April 2003

DRAFT
ENVIRONMENTAL IMPACT STATEMENT
Desolation Flats Natural Gas Field Development Project
Sweetwater and Carbon Counties, Wyoming

MISSION STATEMENT

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

BLM/WY/PL-03/015+1310

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Wyoming State Office
P.O. Box 1828
Cheyenne, Wyoming 82003-1828

In Reply Refer To:

1793 (930)

MAR 17 2003

Dear Reader:

This Draft Environmental Impact Statement (DEIS) on the proposed Desolation Flats Natural Gas Field Development Project is submitted for your review and comment. This DEIS has been prepared to analyze the potential impacts of the drilling and production operations of natural gas wells and associated access roads, pipelines, and production facilities proposed by several companies within the proposed project area located in Carbon and Sweetwater Counties, Wyoming.

A Technical Support Document has also been prepared in conjunction with the DEIS. The document contains detailed technical information for air quality modeling. A limited number of technical support documents are available upon request or they may be reviewed at the BLM offices listed below. The DEIS and the technical support document are both available to be viewed or downloaded, from our Bureau of Land Management (BLM) State website at *www.wy.blm.gov.*

The Desolation Flats Project Area (DFPA) includes 233,542 acres with surface ownership at approximately 96 percent Federal (225,205 acres), 3 percent private (6,660 acres), and less than 1 percent State (1,677 acres). Currently, there are 63 producing and shut-in natural gas wells and a small infrastructure of roads and pipelines for natural gas production already in place within the DFPA.

Three alternatives have been analyzed. Under the Proposed Action the effects of developing the natural gas resource by drilling up to 385 new wells at 361 locations over the next 20 years and developing additional infrastructure needed to link the wells with existing transportation systems were analyzed. Alternative A analyzes the effects of developing 592 new wells at 555 locations and developing additional infrastructure necessary to link the wells with existing transportation systems over the same time period as the Proposed Action. The No Action Alternative analyzes the effects of limiting development in the DFPA to that which has been analyzed in previous environmental documents for the Mulligan Draw and the Dripping Rock/Cedar Breaks. Any development proposal would be reviewed on a case-by-case basis by the BLM.

If you wish to submit comments on the DEIS, we request that you make them as specific as possible. Comments will be more helpful if they include suggested changes, sources, or methodologies. Comments that contain only opinions or preferences, will not receive a formal response. However, they will be considered and included as part of the BLM decisionmaking process.

Two formal hearings will be scheduled to obtain public comments on the proposed project and the DEIS; one at the BLM Rock Springs Field Office, Rock Springs, Wyoming, and one at the BLM Rawlins Field Office, Rawlins, Wyoming. All meetings or hearings, and any other public involvement activities will be announced at least 15 days in advance through public notices, media news releases, and/or mailings.

This DEIS was prepared pursuant to the National Environmental Policy Act and other regulations and statutes, to address possible environmental and socioeconomic impacts which could result from the project. This DEIS is not a decision document. Its purpose is to inform the public of the impacts associated with implementing the companies' drilling proposal, to evaluate alternatives to the proposal, and solicit the public for comments. This DEIS also provides information to other regulatory agencies for use in their decisonmaking process for other permits required for implementation of the project.

Freedom of Information Act Considerations: Public comments submitted for this DEIS, including the names and street addresses of respondents, will be made available for review after the comment period closes at the Rock Springs and Rawlins Field Offices during regular business hours (7:45 a.m. to 4:30 p.m.), Monday through Friday, except holidays. Public comments will be published as part of the Final EIS. Individual respondents may request confidentiality. If you wish to withhold your name or address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

Please retain this copy of the DEIS for future reference as the Final EIS may be published in an abbreviated format. A copy of the DEIS has been sent to affected Federal, State. and local government agencies and to those persons who responded by returning the postcards to BLM which indicated that they wished to receive a copy of the DEIS. Copies of the DEIS are available for public inspection at the BLM offices listed below.

Bureau of Land Management Wyoming State Office 5353 Yellowstone Road Cheyenne, WY 82001	Bureau of Land Management Rock Springs Field Office 280 Highway 191 North Rock Springs, WY 82901	Bureau of Land Management Rawlins Field Office 1300 N. Third Street Rawlins, WY 82301

Sincerely,

Robert A. Bennett

Robert A. Bennett
State Director

Desolation Flats
Natural Gas Development Project

Carbon County, Wyoming
Sweetwater County, Wyoming

ENVIRONMENTAL IMPACT STATEMENT

[X] **Draft** [ ] Final

Lead Agency:

U.S. Department of the Interior, Bureau of Land Management

Cooperating Agencies:

None

Counties That Could Be Directly Affected:

Carbon County, Wyoming
Sweetwater County, Wyoming

Abstract:

The Draft EIS analyzes a proposal by Marathon Oil Company and other Operators to continue to drill additional development wells in their leased acreage within the Desolation Flats natural gas development area (approximately 233,542 acres) of southcentral Wyoming.

The Desolation Flats project is located in Carbon and Sweetwater counties, Wyoming. The DFPA is generally located in Townships 13 through 16 North and Ranges 93 through 96 West, 6th Principal Meridian. Access to the DFPA is provided by WYO 789 from Interstate 80 at Creston Junction south to the intersection with Carbon County Road 608. Access to the interior of the project area is provided by an existing road network developed to service prior and on-going drilling and production activities.

The Proposed Action of drilling approximately 385 natural gas wells at 361 well locations, with a forecasted success rate of 65 percent (250 producing wells) was determined by summarizing drilling plans projected by the Desolation Flats Operators over the next twenty-year planning period. Drilling estimations were based on reasonably foreseeable spacing and drilling projections into areas within the project area where the planned production and development activities would occur. The proposed development is in addition to approximately 63 wells that have been drilled and developed in the project area. The proposed development wells, access roads, pipelines, and other ancillary facilities located on public lands would be permitted with the BLM and the Wyoming Oil and Gas Conservation Commission (WOGCC). Facilities located on privately owned surface would be permitted with the appropriate surface owner. The precise number of additional wells,

locations of the wells, and timing of drilling associated with the proposed natural gas development project would be directed by the success of development drilling and production technology, and economic considerations.

This EIS analyzes the impacts of the Proposed Action, alternative to the Proposed Action, and the No Action Alternative. The EIS describes the physical, biological, cultural, historic, and socioeconomic resources in and surrounding the project area. The focus for impact analysis was based upon resource issues and concerns identified during public scoping.

Potential impacts of concern from development are to recreation and visual impacts; sage grouse breeding and nesting habitat and populations; special status plant and wildlife species; soil erosion and sediment increases within the project area; impacts to air quality; socioeconomic impacts to Carbon and Sweetwater counties; and cumulative effects.

Other Environmental Review or Consultation Requirements:

This EIS, in compliance with Section 7(c) of the Endangered Species Act (as amended), includes the Biological Assessment for the purpose of identifying any endangered or threatened species which are likely to be affected by the Proposed Action.

Lead Agency Contact:

For further information, contact John Spehar at the Rawlins Field Office, (307) 328-4264.

Comments on this draft EIS should be submitted in writing to :

Bureau of Land Management
John Spehar, Project Coordinator
P.O. Box 2407
Rawlins, Wyoming 82301

Date by which comments must be received by the BLM at the above address: 60 days following publication of the EPA Notice of Availability in the Federal Register.

Anticipated date of EPA Notice of Availability published in the Federal Register:

April 2003 (Refer to the Wyoming BLM website at www.wy.blm.gov to find the actual closing date of the comment period).

DRAFT ENVIRONMENTAL IMPACT STATEMENT

DESOLATION FLATS

NATURAL GAS FIELD DEVELOPMENT PROJECT

Prepared for

Bureau of Land Management
Rawlins Field Office
Rawlins, Wyoming

and

Bureau of Land Management
Rock Springs Field Office
Rock Springs, Wyoming

Prepared by

This Environmental Impact Statement was prepared by *Gary Holsan Environmental Planning*, an environmental consulting firm, with the guidance, participation, and independent evaluation of the Bureau of Land Management (BLM). The BLM, in accordance with Federal regulation 40 CFR 1506.5(a) and (b), is in agreement with the findings of the analysis and approves and takes responsibility for the scope and content of this document.

April, 2003

EXECUTIVE SUMMARY

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1.0 INTRODUCTION

This Draft Environmental Impact Statement (DEIS) analyzes the impacts of drilling and production operations in the Desolation Flats natural gas producing area of southcentral Wyoming. The Desolation Flats project area (DFPA) is located in Townships 13 through 16 North and Ranges 93 through 96 West in Carbon and Sweetwater counties, Wyoming as shown on Figure 1-1. The DFPA is located approximately 21 miles south of Wamsutter, Wyoming and 14 miles west of Baggs, Wyoming. The project area encompasses approximately 233,542 acres of mixed federal, state, and private lands. Of this total, 225,205 acres are federal, 1,677 acres are State of Wyoming, and 6,660 acres are private lands.

This DEIS has been prepared pursuant to the National Environmental Policy Act (NEPA) and addresses two field development scenarios (Proposed Action and Alternative A), and a "No Action" alternative (Alternative B). Details of the Proposed Action and its alternatives are described in the DEIS according to the following chapters. Chapter 1 defines the Purpose and Need for the proposed project. Chapter 2 details the parameters of the Proposed Action and other alternatives as well as providing a summary of mitigation measures and agency-required procedures on public lands to avoid or mitigate resource or other land use impacts proposed by the project operators. Chapter 3 of the DEIS discusses the existing environment of the areas and resources that would be affected under each alternative. Chapter 4 examines the environmental consequences to each resource under each alternative and also provides a summary of additional mitigation measures by resource discipline which were identified during the analysis process. The measures and requirements in the DEIS describe how implementation of the Proposed Action or alternatives should be managed to assure minimal impacts in the DFPA and adjacent lands. Chapter 5 discusses the cumulative impacts on the environment which results from the incremental impact of the proposed project when added to past, present, and reasonably foreseeable actions within the cumulative impacts analysis (CIA) area. Chapter 6 of the DEIS summarizes the consultation and coordination accomplished with various federal, State, county, and local agencies, elected representatives, environmental and citizen groups, industries, and individuals potentially concerned with issues regarding the proposed drilling action and alternatives.

The DFPA is located within the administrative boundaries of the Rawlins Field Office (RFO) and the Rock Springs Field Office (RSFO). Approximately 94 percent of the DFPA is located within the RFO area, with the remaining 6 percent located within the RSFO area. The documents that direct management of federal lands within these areas are the RFO Great Divide Resource Management Plan (RMP) (November 1990) and the RSFO Green River RMP (October 1997). The DFPA natural gas development is in conformance with management objectives provided in the Record of Decision (ROD) and approved Great Divide and Green River RMP's, subject to implementation of prescribed mitigation measures proposed by the Operators in Chapter 2 of the DEIS and mitigation measures derived through analysis of impacts in Chapter 4, Environmental Consequences.

Past drilling attempts within the DFPA have been successful. As of January 1, 2002, 63 producing and shut-in natural gas wells, authorized under individual applications for permit to drill (APD's), have been drilled in the DFPA.

The DEIS addresses a Proposed Action and two alternatives that are described in greater detail in the DEIS and briefly summarized here.

1.1 PROPOSED ACTION AND ALTERNATIVES

1.1.1 Proposed Action

The Proposed Action consists of drilling approximately 385 natural gas wells at 361 well locations, with a forecasted success rate of 65 percent (250 producing wells). The Proposed Action was determined by summarizing drilling plans projected by the Desolation Flats Operators over the next twenty-year planning period. Drilling estimations were based on reasonably foreseeable spacing and drilling projections into areas within the project area where the planned production and development activities would occur. The drilling proposal is in addition to existing drilling and production operations. Under the Proposed Action, development would begin in 2003 (subsequent to the release of the ROD) within the DFPA and continue for approximately 20 years, with a LOP of 30-50 years. Drilling would typically occur at 2 to 4 wells per section where hydrocarbons are encountered. Development would likely occur sporadically and not be uniformly spaced throughout the DFPA. Various associated facilities (e.g., roads, pipelines, power lines, water wells, disposal wells, evaporation ponds, compressor stations, gas processing facility) would also be constructed throughout the DFPA. The technical requirements for the Proposed Action are summarized in Chapter 2, Section 2.5 - Plan of Operations. The Operators anticipate that 237 of the 250 producing wells would be located within the RFO area, with the remaining 13 wells located within the Monument Valley Management Area (MVMA), RSFO area. Existing disturbance within the DFPA is approximately 1,506 acres, or around 0.6 percent of the 233,542 acres comprising the project area. During the 20-year construction phase, the Proposed Action would disturb approximately 4,923 acres. Disturbance areas within the DFPA would be reduced following reclamation of pipeline ROW's and unused portions of the drill pad, access road, and ancillary facility disturbances during the production phase. Under the Proposed Action, reclamation would reduce disturbance to 2,139 acres for a total disturbance of 3,645 acres or 1.6 percent of the DFPA.

1.1.2 Alternative A

Alternative A consists of an increase of surface well pads, beyond that described in the Proposed Action, to 592 natural gas wells at 555 locations. Alternative A would be similar to the Proposed Action in that development would begin in 2003 (subsequent to the release of the ROD) within the DFPA and continue for approximately 20 years, with an LOP of 30-50 years. Also, drilling would typically occur at 2 to 4 wells per section where hydrocarbons are encountered. Development would likely occur sporadically and not be uniformly spaced throughout the DFPA. Various associated facilities (e.g., roads, pipelines, power lines, water wells, disposal wells, evaporation ponds, compressor stations, gas processing facility) would also be constructed throughout the DFPA. The technical requirements for Alternative A are the same as described for the Proposed Action (Chapter 2, Section 2.5 - Plan of Operations); however, more overall site disturbance requirements would be necessary for the additional well sites, access roads, pipelines, and ancillary facilities. Assuming a success rate of 65 percent (385 producing wells), the Operators anticipate that 372 of the 385 new producing wells would be located within the RFO administrative area, with the remaining 13 wells located within the MVMA, RSFO administrative area. Total new short-term surface disturbance resulting from Alternative A would be 7,582 acres (approximately 3.2 percent of the DFPA). With Implementation of reclamation, disturbance would be reduced to 3,300 acres for a total disturbance of 4,806 acres or about 2.1 percent of the DFPA.

1.1.3 Alternative B - No Action

Under the No Action Alternative, oil and gas development activities associated with currently held leases would continue and there would be no change to the management practices and levels of activity. Leaseholders would be able to exercise the terms and conditions of leases within the DFPA. Alternative B would allow leaseholders to submit individual APD's and ROW actions. On a case-by-case basis each APD or ROW application would continue to be subject to site specific environmental review prior to authorization by the BLM. Authorizations granted in previously approved projects located within the DFPA would remain in effect. These projects include the Mulligan Draw natural gas project (Mulligan Draw EIS and ROD, USDI-BLM 1992b), and the Dripping Rock Unit/Cedar Breaks oil and gas field development (Dripping Rock Unit/Cedar Breaks Oil and Gas Field Development EA and DR, USDI-BLM 1985). The Mulligan Draw ROD authorized the Mulligan Draw operators to drill and develop a maximum of 45 wells on 640-acre spacing. The Dripping Rock Unit/Cedar Breaks Decision Record (DR) authorized the operators to drill and develop a maximum of 58 wells on 640-acre spacing.

Under Alternative B, additional surface disturbance would occur only on a case-by-case basis. In order to estimate future drilling activity under the No Action Alternative, it was assumed that wells drilled in the DFPA would be drilled at the same rate as the existing wells in the DFPA. As noted in Chapter 2 of the DEIS, 63 producing wells (65 percent success rate) have been drilled within the DFPA to date. Of the 63 wells drilled, 46 (73 percent) were drilled in the Mulligan Draw and Dripping Rock fields. Currently, there are 57 wells left to be authorized in the Mulligan Draw and Dripping Rock fields (Table 1-5). Based on past drilling history, 23 additional wells could be drilled in the Mulligan Draw project area (two of which could be drilled in the MVMA), and 34 additional wells could be drilled in the Dripping Rock/Cedar Breaks project area. Assuming that the operators would drill the 57 wells left to be authorized, the remaining 27 percent of the wells (21 wells) would be drilled in the DFPA outside the Mulligan Draw and Dripping Rock fields. Drilling outside the Mulligan Draw and Dripping Rock/Cedar Break project areas, but within the DFPA, could continue on a case-by-case basis until BLM made a determination that further drilling activities would result in field development. At that point, additional environmental analysis to determine the effects of field development would be necessary. Total wells anticipated to be drilled under the No Action Alternative is estimated at 78 wells.

The technical requirements for Alternative B are the same as described for the Proposed Action (Chapter 2, Section 2.5 - Plan of Operations). The No Action Alternative would have approximately 731 acres of total new short-term surface disturbance (9.37 acres per well) from well locations, new roads or upgrades of existing roads, and new pipelines. Total disturbances would be reduced to 112 acres (1.43 acres of disturbance per well) following reclamation of the pipelines and portions of the well pad not needed for production operations. It is anticipated that the existing natural gas production infrastructure within the DFPA (e.g., compressors, water disposal wells, etc.) would support the No Action Alternative during the 30 - 50 year LOP.

Under any of the alternatives, development could occur on State and private lands within the project area under authorizations granted by the Wyoming Oil and Gas Conservation Commission (WOGCC).

1.1.4 Major Impact Conclusions

The Desolation Flats Natural Gas Development project would cause direct and indirect, short-term and long-term, as well as cumulative disturbance of the human and natural environments. Potential

environmental impacts that would result from implementation of the Proposed Action, Alternative A, or Alternative B are detailed in Chapter 4 of the DEIS. A summary of proposed mitigation measures and agency required procedures on public lands to avoid or mitigate resource or other land use impacts is presented in Chapter 2 of the DEIS. Chapter 4 summarizes the environmental impacts for each resource discipline and mitigation measures identified to avoid or reduce the impacts. These impacts, which were identified during the analysis process, are summarized below.

2.0 RESOURCE ELEMENTS ANALYZED

The following sections summarize impacts to the various resource elements identified during the analysis process for each alternative. Under the No Action Alternative, authorizations granted in previously approved projects located within the DFPA would remain in effect. These projects include the Mulligan Draw natural gas project and the Dripping Rock Unit/Cedar Breaks oil and gas field development (Figure 1-6). The Mulligan Draw ROD authorized the Mulligan Draw operators to drill and develop a maximum of 45 wells on 640-acre spacing. The Dripping Rock Unit/Cedar Breaks Decision Record (DR) authorized the operators to drill and develop a maximum of 58 wells on 640-acre spacing. Other exploratory and development activities could occur outside these previously approved projects within the DFPA following site-specific analysis.

2.1 Geology/Mineral Resources/Paleontology

Implementation of the Proposed Action, Alternative A, or Alternative B would result in construction excavation associated with the development of well pads, access roads, pipelines and other production facilities which could directly result in the exposure and damage or destruction of scientifically significant fossil resources. Construction-related disturbances could result in new fossil resources being discovered and properly recovered and catalogued into the collections of a museum repository, so that they are available for study and scientific evaluation. The potential magnitude of impact to fossil resources associated with the action alternatives (the Proposed Action and Alternative A) varies proportionally with the total number of wells which would be developed under each alternative. The magnitude of impact for Alternative B - No Action, which may allow additional APD's and ROW action on a case-by-case basis, is unknown at present and would depend on the specific action taken and the specific area involved. Under the Proposed Action and Alternatives A and B, areas of proposed ground disturbance would be surveyed by a qualified paleontologist prior to disturbance as required by the authorized officer (AO).

Potential for impacts to project facilities as a result of seismic activity is low, as is the potential for landslides and road subsidence that would temporarily close access roads.

With the exception of petroleum reserves, no major mineral resources would be impacted by implementation of the proposed action or alternative to the proposed action within the DFPA. The proposed project would allow recovery of federal natural gas resources per 43CFR 3162(a) and generation of private and public revenues, if drilling leads to gas discovery and development.

No significant impacts to important surface resources or other geologic resources would occur under the Proposed Action. Mitigation measures discussed in Chapters 2 and 4 should reduce potential impacts to geologic/mineral/paleontologic resources.

2.2 Air Quality

Gaseous air pollutant emissions discharged from the wellhead (e.g.; venting and flaring) and from natural gas compressor activities, as well as dust and exhaust from construction and maintenance activities, have been identified as issues of concern.

No significant adverse impacts to air quality are anticipated as a result of the implementation of the Proposed Action, Alternative A or the No Action Alternative. Localized increases in criteria pollutants would occur, but maximum concentrations would be below applicable federal and state standards. Similarly, hazardous air pollutant concentrations and incremental increases in cancer risk would also be below applicable significance levels. Potential impacts to visibility and acid neutralizing capacity would be below the levels of acceptable change.

Under the Proposed Action, 385 wells would be developed with an expected success rate of 65 percent or 250 producing wells. Alternative A represents a 35 percent increase in well development when compared to the Proposed Action and it is expected that compression requirements for the Proposed Action would also be increased by a similar percentage. Potential air quality impacts resulting from the implementation of the Proposed Action would be less than for Alternative A. No significant adverse impacts to air quality are anticipated as a result of the implementation of the Proposed Action.

Impacts to air quality under the No Action Alternative would occur at allowable levels and no significant impacts are anticipated. Actions approved under the Mulligan Draw EIS and Dripping Rock/Cedar Breaks EA may still be completed within the project area. Completion of the previously approved actions would involve the development of approximately 71 wells, therefore the impacts are expected to be less than Alternative A or the Proposed Action. In the absence of further development in the DFPA, no additional project related air quality impacts would occur.

2.3 Soils

Impacts resulting from drill pad, access road, facility site, and pipeline ROW construction could include removal of vegetation, exposure of the soil, mixing of soil horizons, soil compaction, loss of topsoil productivity, and increased susceptibility of the soil to wind and water erosion.

Construction of the Proposed Action would variously disturb approximately 4,923 acres of soil. This total area of temporary disturbance would comprise approximately 2.1 percent of the 233,542 acre project area. Combined with the existing disturbance of 1,506.4 acres, total disturbance would be approximately 6,429.4 acres or 2.8 percent of the 233,542 acre project area. This total area of temporary disturbance would be reduced through successful reclamation.

During the life of the project (30-50 years), total disturbances would be reduced to 2,139 acres (336 acres associated with 235 wells having 1.4 acres of remaining disturbance per well site, 1,706 acres of roads [this assumes a 65 percent drilling success rate with roads to unsuccessful wells being reclaimed] and 97 acres of surface disturbance associated with ancillary facilities) or approximately 0.92 percent of the 233,542 acre project area.

Well pads would be reclaimed to the 1.4 acre of disturbance/well and remaining disturbed road dimensions would be approximately 16.0 feet wide, or 0.6 acres per well, and 0.0 acres for pipelines. The ancillary facility would not be reclaimed since the full size of the site would be needed during production. These remaining disturbance areas would represent approximately

2,139 acres or 0.92 percent of the total project area. This disturbance would be combined with the existing disturbance of approximately 1,506.4 acres for a total of 3,645.4 acres, or 1.6 percent of the 233, 542 acre project area. This long-term disturbance would not preclude achievement of the objectives of the Great Divide and Green River RMP's and significance criteria described in Chapter 4 for soils.

Construction under Alternative A would variously disturb approximately 7,582 acres of soils. This total area of temporary disturbance would comprise approximately 3.2 percent of the 233,542 acre project area. Combined with the existing disturbance of 1,506.4 acres, total project area disturbance would be approximately 9,088.4 acres or 3.9 percent of the 233,542-acre project area.

During the life of the project (30-50 years), total disturbances would be reduced by reclamation to 3,300 acres or approximately 1.4 percent of the 233,542-acre project area. This disturbance would be combined with the existing disturbance of approximately 1,506.4 acres for a total of 4,806.4 acres, or 2.1 percent of the project area.

Under the No Action Alternative, soils would be impacted as described for the action alternatives as APD's are granted by the BLM pursuant to previous authorizations. Similar erosion, runoff, and sediment control and revegetation measures would be applied to minimize adverse impacts to soils. Such methods would likely reduce impacts of the No Action Alternative to non-significant levels.

2.4 Water Resources

Potential impacts due to the proposed project include increased surface water runoff and off-site sedimentation due to soil disturbance; increased salt loading and water quality impairment of surface waters; and channel morphology changes due to road and pipeline crossings. The magnitude of impacts to water resources would depend on the proximity of the disturbance to the drainage channel, slope aspect and gradient, degree and area of soil disturbance, soil character, duration of time within which construction activities would occur, and the timely implementation and success/failure of mitigation measures. Impacts would likely be greatest after the start of construction activities and would likely decrease in time due to natural stabilization, reclamation, and revegetation efforts. Construction activities would likely occur within a 20-year period. Petroleum products and other chemicals could be accidentally spilled resulting in surface and groundwater contamination. Similarly, reserve and evaporative pits could leak and degrade surface and groundwater if liners were punctured or liners were not installed. Authorization of the proposed project would require full compliance with RMP management directives that relate to surface and groundwater protection, Executive Order 11988 (flood plains protection), and the Federal Clean Water Act (CWA) in regard to protection of water quality and compliance with Section 404.

The proposed state-of-the-art drilling and completion techniques make it unlikely that aquifer contamination would occur during drilling. Should aquifer mixing occur, the magnitude of mixing would be relatively small due to the relatively short period of time drilling is conducted. A Spill Prevention, Control, and Countermeasure Plan would be implemented to prevent petroleum products and other chemicals from contaminating groundwater aquifers. If deemed necessary, reserve and evaporative pits would be lined to prevent drilling fluids and produced water from contaminating aquifers.

Authorization of the Proposed Action or Alternative A would require full compliance with RMP management directives that relate to surface and groundwater protection, EO 11990 (floodplains protection), and the CWA in regard to protection of water quality and compliance with Section 404.

These regulations require that certain permits/authorizations be obtained for project authorization including an NPDES permit; a surface runoff, erosion, and sedimentation control plan; an oil spill containment and contingency plan; and CWA Section 404 permits. Most of the ephemeral drainage channels within the DFPA are classified as Waters of the U.S. and are often associated with jurisdictional wetlands. Crossings of these channels and associated wetlands would require authorization from the COE through the CWA Section 404 permitting process. However, these channel crossings would likely receive expedited authorization from the COE through General Permit 98-08. Other project facilities such as well sites and/or facilities sites could not be located in Waters of the U.S. and therefore, Section 404 permitting would not be necessary for such facilities. Each individual channel crossing would be reviewed during the APD/ROW permitting process for specific permit requirements under Section 404 of the CWA. No significant impacts would likely result given the assumptions and compliance with management direction identified previously. Most adverse impacts to water resources would be avoided or reduced through implementation of mitigation measures identified in Chapter 2.

Under the No Action Alternative, individual APD's would continue to be approved by the BLM on a case-by-case basis.

2.5 Vegetation/Wetlands

Implementation of the Proposed Action or Alternative A would result in vegetation removal and soil handling associated with the construction and installation of well pads, pipelines, access roads, and other facilities as described in Chapter 2 of the DEIS. Direct impacts would include the short-term loss of vegetation (modification of structure, species composition, and areal extent of cover types). Indirect impacts would include the short-term and long-term increased potential for invasive plant establishment and expansion; exposure of soils to accelerated erosion; shifts in species composition and/or changes in vegetative density; reduction of wildlife habitat; and changes in visual aesthetics.

The duration and magnitude of impacts to vegetation cover types would depend on the locations of well sites and access roads, the success of mitigation and revegetation efforts. In terms of successful site stabilization, necessary time should be on the magnitude of 3-5 years. Revegetation success would depend on the amount and quality of topsoil salvaged, length of time stockpiled, and respread depth over disturbed areas, as well as seed quality and post-seeding weed control efforts.

The likelihood of impact is greatest for the primary vegetation cover types of Wyoming big sagebrush, desert shrub, and basin exposed rock/soil types which occupy 83.8 percent of the project area. Except for habitats occupied by plant species of concern, clearing of upland cover types would not be significant because upland cover types are generally abundant and widely distributed throughout the region and/or have been previously impacted (e.g., disturbed land).

Under the No Action Alternative, vegetation would continue to be impacted as individual APD's are granted by the BLM. Loss of upland cover types would not be significant. If present, impacts to wetlands would be assessed and mitigated on a case-by-case basis similar to the action alternatives. Rare plant surveys would continue to be performed prior to earth-surface disturbance activities associated with individual projects. Invasive plant programs would be implemented per stipulations in individual APD's.

2.6 Range Resources and Other Land Uses

Construction of the Proposed Action would temporarily affect 4,923 acres (1,444 acres for well locations and associated facilities, 97 acres for ancillary facilities, 758 acres for pipelines, and 2,624 acres for road ROW's). Assuming that reclaimed areas would be suitable for grazing after five years, a maximum of 2,871 acres would be disturbed at any one time. Once reclamation has been satisfactorily completed on all disturbed areas, the total area of impact would be reduced to approximately 2,139 acres.

Stocking rates for the 12 RFO-administered grazing allotments affected by the Proposed Action and alternatives average 12 acres per AUM. The one affected grazing allotment administered by the RSFO averages 9 acres per AUM. Depending on the actual locations of the drilling and ancillary facilities with respect to forage productivity, lost forage could result in an average annual loss of 158 AUM's (over the 30-50 year LOP) in the RFO portion of the project area (about one-half of one percent of the 31,000 total AUM's in these allotments) and an average annual 12 AUM's in the RSFO portion. The portion of the RSFO-administered allotment (the Rock Springs Allotment) that lies within the DFPA receives little or no use because of terrain and access considerations, so temporary loss of forage in that area would not be likely to impact grazing levels in that allotment. The estimated average annual loss of 12 AUM's would represent a negligible portion of the 109,442 AUM's permitted for the Rock Springs Allotment.

The increased activity associated with drilling and field development would result in increased opportunities for vehicle/livestock collisions, particularly in the period immediately after lambing and calving season when young animals are active and difficult to see. Given the low traffic volumes associated with field operations, vehicle/livestock collisions are of less concern for the long term. There is also increased potential for damage to livestock control structures and concern for the timely repair of structures to BLM standards. Construction of roads in the project area could allow livestock operators additional access for livestock management operations.

Drilling and construction activities could allow introduction of invasive/non-native species into the DFPA. Invasive/non-native species compete with desirable species, rendering an area less productive as a source of forage for livestock and wildlife.

The area removed from forage production under Alternative A could result in an average annual loss of 248 AUM's (over the 30-50 year LOP) in the RFO portion of the DFPA (about 0.8 of one percent) and 18 AUM's in the RSFO portion. The potential for livestock/vehicle accidents, damage to livestock control structures and spread of invasive/non-native species would increase along with the 55 percent increase in drilling and construction activity associated with Alternative A.

Under Alternative B (No Action), development would proceed on a case-by-case basis. Development within the Mulligan Draw and Dripping Rock Unit/Cedar Breaks areas would be authorized not to exceed one well per 640 acres. The amount of forage lost, the potential for livestock/vehicle accidents, damage to livestock control structures and spread of invasive/non-native species would depend on the actual level of drilling and construction activity that would occur under Alternative B.

2.7 Wildlife

The implementation of either the Proposed Action or Alternative A would result in direct loss of wildlife habitat from surface disturbance associated with the construction of well sites and related access roads and pipelines. In addition, some wildlife species would be indirectly impacted by temporary displacement from habitats in the vicinity of disturbed areas. The potential for collisions between wildlife and motor vehicles would also increase due to the construction of new roads and increased traffic levels on existing roads. The nature of impacts to wildlife is similar between the Proposed Action and Alternative A. However, the magnitude of potential impacts would be greater under Alternative A, because of the greater number of well sites and increased number of miles of associated access roads and pipelines. These impacts are not expected to be significant under either action alternative and would decrease after completion of construction and successful reclamation. Potential impacts to wildlife under the No Action Alternative would be similar in nature to those under the action alternatives, but at a reduced level. Significant impacts to wildlife species under the action alternatives would be avoided through application of the Wildlife Monitoring/Protection Plan (Appendix H) and all appropriate mitigation measures identified in this document.

The DFPA contains yearlong and crucial winter range for pronghorn, elk, and mule deer. A small percentage of seasonal big game ranges are expected to be impacted directly and big game species may be indirectly impacted through displacement. Direct, indirect, and cumulative impacts to big game species would be greater under Alternative A than the Proposed Action, but are not expected to be significant under either action alternative. Potential impacts to wild horses are not expected to be significant under any alternative.

Leks and nesting habitat of greater sage-grouse leks are present on the DFPA. Active leks would be avoided, and therefore, would not be disturbed. A small percentage of nesting habitat may be disturbed, but impacts are not expected to be significant. Direct, indirect, and cumulative impacts to greater sage-grouse would be greater under Alternative A than the Proposed Action, but are not expected to be significant under either action alternative.

Raptor nests occur in and adjacent to the DFPA. Activity status of raptor nests located near project related developments would be monitored as development occurs. Significant impacts to raptors are not expected given the application of mitigation measures that would preclude nest abandonment or reproductive failure. Direct, indirect, and cumulative impacts to raptors would be greater under Alternative A than the Proposed Action, but are not expected to be significant under either action alternative.

The application of prescribed avoidance, monitoring (Wildlife Monitoring/Protection Plan, Appendix H) and mitigation measures in this document would reduce the impact potential and allow for either of the action alternatives to be performed without significant impacts to wildlife resources.

2.8 Special Status Plant and Wildlife Species

Threatened, endangered, candidate, and proposed plant and wildlife species that may potentially occur on the DFPA include: Ute ladies'-tresses, mountain plover, black-footed ferret, bald eagle, and Canada lynx. The Ute ladies'-tresses is not expected to occur on the DFPA due to lack of suitable habitat. A small percentage of potential mountain plover and potential black-footed ferret habitat may be disturbed. The potential for collisions between bald eagles and motor vehicles may increase due to the construction of new roads and increased traffic levels on existing roads. The

Canada lynx is not expected to occur on the DFPA due to a lack of suitable habitat. Threatened, endangered, and proposed fish species that occur downstream of the DFPA in the Colorado River System include: Colorado pikeminnow, humpback chub, bonytail, and razorback sucker. None of the threatened, endangered, and proposed wildlife and fish species are expected to be adversely effected under either action alternative.

A total of 35 BLM State of Wyoming sensitive wildlife and fish species may occur on the DFPA. State of Wyoming sensitive species, as defined by the BLM, are those that could become endangered or go extinct within the State. A small percentage of potential habitat for several sensitive wildlife species may be disturbed. However, none of the sensitive wildlife and fish species are expected to be adversely affected under either action alternative.

The application of prescribed avoidance, monitoring (Wildlife Monitoring/Protection Plan, Appendix H) and mitigation measures in this document would reduce the impact potential and allow for either of the action alternatives to be performed without significant impacts to special status wildlife species.

2.9 Recreation

Well drilling, testing and production operations, and associated site preparation and construction activities would cause alterations to the recreation setting and recreation opportunities available to persons using the area. Some recreationists could be temporarily or permanently displaced from certain locations associated with drilling and production activities. Displacement of recreationists could also result from changes in the numbers or distribution patterns of wildlife that attract hunters and wildlife observers to the area. The presence of construction and drilling equipment and associated increase in industrial activities in the area could reduce opportunities for recreationists seeking to experience solitude and isolation from human activity. Such changes could also result in displacement or redistribution of recreationists who would choose to avoid such conditions, as well as result in reduced satisfaction among others who might continue to engage in recreation activities in the area.

There would be no significant adverse impact to recreation resources if recommended mitigation measures are employed, with the exception of that part of the project area located inside the MVMA. However, some users would be temporarily or permanently displaced and for some that continue to recreate in the area, the experience would be diminished. Several generations of recreationists could be affected.

MVMA and WSA

The MVMA is located within the checker board land pattern within the project area. Drilling and possible production activities in the 14 square miles of BLM administered lands in the DFPA inside the MVMA would have significant adverse impacts to the future recreation potential of those 14 sections; impacts would include surface disturbance, changes to general landscape character and visual resources. Future generations of recreationists would be denied the possibility of experiencing isolation and solitude afforded by those 14 sections as part of a potential future special management area.

Also, drilling within the MVMA and along the 21 mile long common boundary between the DFPA and the Adobe Town WSA could preclude quality recreation opportunities for those seeking

solitude and isolation within the northern and western portion of the adjacent Adobe Town WSA until all wells have been abandoned and fully reclaimed. Attempts to mitigate by screening and distancing the project components from the edge of the WSA would not completely eliminate the influence of oil and gas development on the WSA. This is considered a significant impact.

2.10 Visual Resources

Both short-term and long-term impacts to the visual resources would occur where patterns of area, line, form, color, and texture in the characteristic landscape would be contrasted by drilling equipment, production facilities, and/or construction related damage to vegetation, topography or other visible features. The severity of impact depends upon scenic quality, sensitivity level, and distance zone of the affected environment, reclamation potential of the landscape disturbed, and the level of disturbance to the visual resource created by the Proposed Action.

Adverse impacts from well construction would occur within the short term due to contrast in line, form, color and textures associated with equipment, surface disturbance, and fugitive dust juxtaposed with the existing landscape. Long-term impacts would result from production facilities, access roads, and fugitive dust.

With the exception of the 23 square miles of project area inside the MVMA (14 square miles of BLM administered lands), there would be no significant adverse impact to visual resources if recommended mitigation measures are employed. However, some users would be temporarily or permanently displaced and for some that continue to recreate in the area, the visual experience would be diminished because of noise, dust and a general degradation of visual quality.

MVMA and WSA

Drilling in the MVMA could preclude high visual quality recreation opportunities for those seeking solitude and isolation within the northern and western portion of the DFPA and adjacent Adobe Town WSA until all wells have been abandoned and fully reclaimed. Several generations of recreationists could be affected. This is considered a significant adverse impact.

2.11 Cultural Resources

Potential impacts to specific eligible or unevaluated properties are unknown at this time. In general, the DFPA has a moderate to high site density, and therefore, high archaeological sensitivity. Certain geomorphic situations have a greater archaeological potential than other areas especially in terms of significant cultural resources. These situations include eolian deposits (sand dunes, sand shadows and sand sheets) and alluvial deposits along major drainages.

Although the DFPA has a high degree of archaeological sensitivity, impacts to known cultural properties would not be significant with implementation of the Proposed Action or alternatives. Potential impacts to known and anticipated cultural resources can be alleviated through appropriate mitigation measures. If cultural resources on, or eligible to, the National Register are to be adversely impacted by the proposed development, then the applicant, in consultation with the surface managing agency and the SHPO, shall develop a mitigation plan. Construction would not proceed until terms of the mitigation plan are satisfied.

2.12 Socioeconomics

Economic effects of the drilling and field development phase of the Proposed Action would include an estimated $840 million in direct expenditures to the Operators, which would generate an estimated total of $1.145 billion in total economic impact (including $154 million in earnings) in southwestern Wyoming over the 20-year field development period. The operations phase of the Proposed Action would generate $2.977 billion in total economic impact including $218.4 million in earnings over the 30 to 50 year LOP. This positive economic impact would be offset slightly by reductions in grazing activity. Under the estimates and assumptions used for this assessment, these reductions would total $442,000 including $80,000 in earnings over the life of the project. It is possible that the Proposed Action would result in reductions in economic activity associated with hunting and other recreation activities in the DFPA, although the increased access afforded by development of roads may attract some new hunters and recreation visitors. Displaced hunters and recreationists may relocate to other areas within southwest Wyoming, although opportunities for solitude and isolation are becoming increasingly limited within the region.

The Proposed Action would result in an estimated 246 drilling and field development annual job equivalents (direct and indirect) and 156 production-related annual job equivalents in southwest Wyoming. Some of these jobs would be filled by existing residents, however, an estimated peak in-migrant population of 442 workers is anticipated for the year 2021. This population would be disbursed throughout southwest Wyoming but likely concentrated in Rock Springs and, to a lesser extent, Rawlins. These communities could accommodate anticipated population growth with existing housing resources and infrastructure, but small communities closer to the DFPA (Wamsutter and Baggs) would need to develop housing and improve some infrastructure before being able to absorb substantial additional population. Wamsutter and Baggs would receive minimal tax revenues from the Proposed Action and would be required to seek other sources of funding to develop infrastructure to accommodate growth.

The Proposed Action would generate an estimated $123 million in property tax revenues for Sweetwater County over the life of the project and $15.5 million in Carbon County. The Proposed Action would also generate an estimated $5.3 million in sales and use tax revenue for the State of Wyoming, $3.4 million for Sweetwater County and $471,000 for Carbon County. Proposed Action-related Mineral Severance Tax revenues to the State of Wyoming would total an estimated $119 million, and Wyoming's share of Federal Mineral Royalties would total an estimated $283 million.

Community acceptance of the Proposed Action would be mixed. Some residents, particularly those with direct and indirect interests in oil and gas development, would likely be supportive. Those who believe that recreation resources, wildlife habitat and relatively undisturbed landscapes in the project area would be negatively impacted would be dissatisfied with implementation of the Proposed Action.

The economic, employment, population and fiscal effects of Alternative A would be about 54 percent greater than those associated with the Proposed Action. Under current conditions, the communities of Rock Springs and Rawlins could accommodate this growth with existing resources. If new housing were to be developed in the communities of Wamsutter and Baggs and a substantial number of Project employees were to relocate to these communities, existing infrastructure could be strained under Alternative A.

Community acceptance would likely remain mixed under Alternative A, but an increased number of residents might believe that recreation, wildlife habitat and undisturbed landscapes would be negatively impacted by the increased level of development.

Economic, employment, population and fiscal effects of Alternative B (No Action) would be dependent on the level of drilling and field development which actually occurs in the Mulligan Draw and Dripping Rock Unit/Cedar Breaks areas coupled with that approved by the BLM on a case-by-case basis, and by the WOGCC on private and State-owned lands. Similarly, community acceptance of the No Action Alternative would remain mixed and dependent on the level of development actually approved. Those that support oil and gas development would likely be dissatisfied with the foregone economic opportunities associated with the Proposed Action and Alternative A. Hunters and recreationists who use the Project Area would experience less dissatisfaction with loss of isolation, solitude and undisturbed landscapes under Alternative B, unless development occurs in areas that are routinely used by these groups.

2.13 Health and Safety

Potential risks associated with the proposed action include the normal risks associated with traffic, construction activities, and drilling and production operations. In most instances, exposure to these hazards would be limited to the project-related workforce. Implementation of environmental protection and mitigation measures described in Chapters 2 and 4 would minimize the risk of exposure to these hazards. H_2S is not present within the DFPA, and therefore, is not a safety concern for this area. A Hazardous Materials Management Plan has been prepared by the Operators and is appended to this DEIS (Appendix D).

The Proposed Action and alternatives would not result in any substantial, increased risks to public health and safety; nor would they introduce any unusual occupational hazards or threats to the health and safety of oil and gas field workers.

2.14 Noise

Noise associated with drilling, field development and production could potentially affect human comfort and safety (at extreme levels) and modify animal behavior. Noise levels in excess of the 55 dBA maximum standards can occur during construction and maintenance of well sites, access roads, ancillary facilities such as compressor sites and pipelines. However, perception of sound varies with intensity and pitch of the source, air density, humidity, wind direction, screening/focusing by topography or vegetation, and distance to the observer. Under typical conditions, excess levels decline below the level of significance (55 dBA) at 3,500 feet from the source. Drilling and field development-related noise impacts would be short-term, occurring on an intermittent basis at different locations throughout the DFPA throughout the estimated 20-year drilling and field development cycle. Substantially lower and less frequent noise disturbances would occur throughout the productive life of the field.

Construction-related impacts would be short-term, lasting as long as construction activities were ongoing at well sites, access roads, pipelines, and other ancillary facilities such as compressor sites. Noise would be created over a longer term at the individual well sites as a result of drilling activities.

Overall, noise produced by drilling and field development operations would be moderate because of the dispersed and short-term nature of these activities. Given the remoteness and isolation of the DFPA, drilling, field development and production operations would not affect noise sensitive locations for humans. Other users of the DFPA would be affected infrequently for periods of short duration as they move through the area. Affects on noise sensitive locations for animals would be avoided by implementation of the preconstruction planning and design measures described in Chapter 2 of the DEIS.

3.0 SCOPE OF ANALYSIS

The purpose of the scoping process, as stipulated (40 CFR, Parts 1500-1508), is to identify important issues, concerns, and potential impacts that require analysis in the EIS and to eliminate insignificant issues and alternatives from detailed analysis. Public participation, consultation, and coordination have occurred throughout the planning process for this EIS through *Federal Register* notices, press releases, scoping meetings, individual contacts, and informal consultation. Contact dates and actions taken by BLM are summarized in Chapter 6 - Consultation and Coordination. All information received during the scoping process is available for review at the Rawlins and Rock Springs Field Offices.

Also, during preparation of the DEIS, the BLM and consultant Interdisciplinary Team (IDT) have communicated with, and received input from various federal, state, county, and local agencies, elected representatives, environmental and citizen groups, industries, and individuals potentially concerned with issues regarding the proposed drilling action.

4.0 SUMMARY OF CUMULATIVE EFFECTS

The Proposed Action and alternatives have the potential to create cumulative impacts when combined with past, present and reasonably foreseeable future activities (RFFA's). The cumulative impact analysis (CIA) conducted for this DEIS applies to the Proposed Action and Alternative A.

Chapter 5 of the DEIS identifies potential cumulative impacts for each of the resources assessed in this document.

The CIA assumes compliance with all applicable federal, state and local regulations and permit requirements, compliance with the Great Divide and Green River RMP's, and successful implementation of the mitigation measures identified in Chapters 2 and 4 of the DEIS.

Potential cumulative impacts are assessed at the resource level for four CIA areas: (1) within the Desolation Flats Project Area, (2) within the watersheds that contain the DFPA, (3) within the southeastern Sweetwater County and southwestern Carbon County area, and (4) within the southwestern Wyoming and northeastern Colorado region.

Past and present activities and RFFA's within the DFPA include livestock grazing; dispersed recreation; and oil and gas exploration, development, production and product transportation. Total disturbance (after reclamation) within the DFPA would comprise an estimated 1.6 percent of total land area within the Project Area for the Proposed Action and 2.1 percent for Alternative A.

Past and present activities within the Barrel Springs Draw and Sand Creek drainage basins, the two basins that contain the DFPA, also include livestock grazing; dispersed recreation; and oil and gas exploration, development, production and product transportation. Utility, communication and transportation corridors also traverse these basins, and portions of the Creston/Blue Gap, Continental Divide/Greater Wamsutter II and South Baggs natural gas project areas are contained in the basins. Cumulative post-reclamation disturbance is projected to equal 0.89 percent of total land area within the two basins. Significant cumulative impacts are not anticipated for any resource within the Barrel Springs or Sand Creek basins.

Cumulative socioeconomic effects were assessed for Sweetwater and Carbon counties and the communities near the Project Area. The current potential for cumulative socioeconomic impacts in these counties is associated with the Proposed Action and alternatives coupled with ongoing and proposed natural gas drilling and field development (including coalbed methane development). Assuming that natural gas development levels will continue to be cyclic (i.e., periods of accelerated development followed by periods of moderate development levels), potential cumulative impacts on area socioeconomic conditions would include substantially positive effects on local economic conditions, increased employment opportunities, and increased federal, state and local tax revenues. Potential negative effects include increased demand on housing resources and community services in Wamsutter and Baggs from in-migrating employees and families associated with drilling and field development projects. The communities of Rock Springs and Rawlins could accommodate cumulative natural gas development at historic levels with existing housing and infrastructure, but Wamsutter and Baggs would need to add housing resources and some infrastructure to accommodate any increase in demand over current levels. Neither Wamsutter nor Baggs would receive significant tax revenues from natural gas development or production; these communities would need to obtain funding from other sources to finance infrastructure improvements required to accommodate growth.

Community attitudes toward cumulative natural gas development are likely to be positive for those community members who benefit directly or indirectly from the associated economic activity, but less positive or negative for those whose activities (grazing, hunting, dispersed recreation) or values (undisturbed landscapes and opportunities for solitude and isolation) would be affected by cumulative natural gas development.

Recent national and world events suggest the possibility that the future pace of development of natural gas resources in southwest Wyoming could exceed historic cyclic levels. Dramatic and sustained increases in natural gas demand and prices brought about by world events, changes in national energy policy or sustained high levels of economic growth could result in corresponding dramatic increases in the pace of development in Sweetwater and Carbon counties.

Given the number of wells authorized in the two counties, dramatic increases in the pace of development could result in socioeconomic impacts substantially larger than those identified above. It is conceivable that population increases associated with accelerated development could exceed housing resources and community facility and service capacity even in larger communities such as Rock Springs and Rawlins. In the case of such an extreme scenario, negative community impacts could be avoided or mitigated by the development and implementation of a coordinated industry/local government impact plan.

Cumulative impacts to recreation and visual resources would occur within southeastern Sweetwater County and southwestern Carbon County. Activities associated with the Proposed Action and alternatives would add to the substantial level of impact to visual and recreation resources already existing in the area. Although natural gas projects occur in different viewsheds, the composite experience for those traveling through the area, particularly on back roads, is one of a highly modified landscape. Contrasts in line, form, color and texture begin to dominate the viewer's experience. Views of large, relatively undisturbed patches of the characteristic Wyoming Red Desert landscape are becoming less common. These conditions would increase the likelihood that viewers, particularly back country recreationists, would be dissatisfied with the visual component of their recreation experience.

The substantial level of natural gas development and activity in the area also limits the ability of hunters and non-consumptive recreationists to adapt to changing patterns of wildlife use of the landscape, find more pristine environments, and relocate their activities in nearby areas. Disturbance in 23 square miles of the existing MVMA, an important area for recreationists seeking solitude and isolation, would substantially reduce relocation options. These conditions increase the probability that hunters and other recreationists would be displaced, dissatisfied, or have a less enjoyable recreation experience. It is important to note that development could occur in the privately held portions of this area regardless of the approval of the Proposed Action.

Cumulative climate and air quality impacts were assessed for the region that contains southwestern Wyoming and northwestern Colorado. The cumulative impact analysis conducted for climate and air quality predicts that the maximum criteria pollutant concentrations would not exceed federal or state ambient air quality standards. In addition, cumulative impacts are predicted to be less than the prevention of significant deterioration (PSD) Class I increments. Potential impacts to sensitive lake acid neutralizing capacity would be less than the applicable limits of acceptable change.

Visibility impacts of up to 25 days exceeding 0.5 delta-deciview (Δ dv) and 7 days exceeding 1.0 Δ dv. are predicted as a result of cumulative emissions (0.5 Δ dv and 1.0 Δ dv. are the two thresholds of visibility change used for reporting purposes). However, the presence or absence of the Proposed Action or alternatives does not significantly change the cumulative visibility impact. On only 2 of the 25 days would the absence of the Proposed Action change the visibility impacts to levels below the thresholds, and these are only for days slightly over 0.5 Δ dv. None of the Δ dv days over 1.0 would be changed to below the 1.0 threshold with the absence of the Proposed Action. Of the predicted two days that the Proposed Action would contribute to 0.5 Δ dv impacts, one occurs at Dinosaur National Monument and the second occurs at Rawah Wilderness, both located in Colorado.

5.0 AGENCY-PREFERRED ALTERNATIVE

The Proposed Action is the BLM's Preferred Alternative for the Desolation Flats Natural Gas Development Project. The selection of the Proposed Action incorporates compliance with the Great Divide RMP, Green River RMP and implementation of various mitigation measures. Such measures include the following: (1) proponent-committed and BLM required project-wide measures for preconstruction planning and design and specific resources, (2) BLM Standard Mitigation Guidelines (Appendix A), (3) Reclamation Plan (Appendix C), (4) Hazardous Materials Management Plan (Appendix D), (5) Wildlife Monitoring/Protection Plan (Appendix H), and (5)

additional mitigation measures recommended in Chapter 4 (Mitigation Summary of each resource element). The BLM has concluded that these detail a complete listing of practicable measures to reduce environmental harm resulting from the development and management in the DFPA. The BLM also feels that the analyses demonstrate that the Proposed Action would meet the requirements of Federal Regulation 43 CFR 3162(a), which directs the Operators to conduct "....all operations in a manner which ensures the proper handling, measurement, disposition, and site security of leasehold production; which protects other natural resources and environmental quality; which protects life and property; and which results in maximum ultimate economic recovery of oil and gas with minimum waste and with minimum adverse effect on ultimate recovery of other mineral resources."

Selection of the Proposed Action as the Agency-Preferred Alternative does not imply that this will be the BLM's final decision. Additional information acquired during the DEIS public comment period, and public and BLM internal review comments, may result in the selection of an alternative in the ROD that combines components of the Proposed Action and the other alternatives to provide the best mix of operational requirements and mitigation measures needed to reduce environmental harm.

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ABBREVIATIONS/ACRONYMS

LIST OF ABBREVIATIONS/ACRONYMS

AACL	Acceptable Ambient Concentration Level
AADT	Annual Average Daily Traffic
ABD	abandoned
Ac or ac	acres
ACEC	Area of Critical Environmental Concern
AJE	Annual Job Equivalents
ANC	Acid Neutralizing Capacity
ANS	artificial nesting structure
AO	Authorized Officer
APD	Application for Permit to Drill
APE	area of potential effect
APHIS-WS	Animal and Plant Health Inspection Service - Wildlife Services
AQD	Air Quality Department
AQRV	Air Quality Related Values
AUM	animal unit month
BA	Biological Assessment
BACT	Best Available Control Technology
bbl	barrel
BCF	billion cubic feet
BMP	Best Management Practices
BLM	Bureau of Land Management
BWPD	barrels of water per day
CBM	coalbed methane
CCR 700	Carbon County Road 700
CCR 701	Carbon County Road 701
CDOT	Colorado Department fo Transportation
CDPHE-APCD	Colorado Department of Public Health and Environment - Air Pollution Control Division
CD/W II	Continental Divide/Wamsutter II
CEQ	Council for Environmental Quality
cfs	cubic feet per second
CIA	Cumulative Impacts Analysis
CIAA	Cumulative Impact Assessment Area
CO	Carbon Monoxide
CO 13	Colorado Highway 13
COE	U.S. Corps of Engineers
CWA	Clean Water Act
CWRRI	Colorado Water Resource Research Institute
CWYL	crucial winter/yearlong
dBA	decibel
dv	deciview
Δ dv	change in deciview
DEQ	Department of Environmental Quality
DFPA	Desolation Flats Project Area
DNA	Documentation of NEPA Adequacy
DOE	U. S. Department of Energy
DR	Decision Record
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMT	emergency medical vehicle
EO	Executive order
EPA	Environmental Protection Agency
ESA	Endangered Species Act of 1973
FEMA	Federal Emergency Management Act
FS	Forest Service
FTE	full time equivalent
FY	fiscal year
FWS	U.S. Fish and Wildlife Service
GDRA	Great Divide Resource Area
g/hp-hr	grams per horsepower-hour

LIST OF ABBREVIATIONS/ACRONYMS

GP	General Permit
GRRA	Green River Resource Area
GRI	Gas Research Institute
GWA II	Greater Wamsutter Area II
Ha	hectare
HAP	Hazardous Air Pollutants
HMA	Herd Management Areas
HPRCC	High Plains Regional Climate Center
HWA	Hayden-Wing Associates
I-80	Interstate 80
IDT	interdisciplinary team
IMPROVE	Interagency Monitoring of PROtected Visual Environments
ISC	Industrial Source Complex
IWAQM	Interagency Workgroup on Air Quality Monitoring
km	kilometers
LAC	Level of Acceptable Change
LOP	Life of Project
MEI	Maximally Exposed Individual
MFP	Management Framework Plan
$\mu g/m^3$	micrograms per cubic meter
mi	mile
MLE	Most Likely Exposure
MSDS	Material Safety Data Sheet
MSLE	Modified Soil Loss Equation
MU	map unit
MVMA	Monument Valley Management Area
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOS	Notice of Staking
NPC	National Petroleum Council
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSO	No Surface Occupancy
NWI	National Wetland Inventory
NO_x	oxides of nitrogen
O_3	Ozone
OGIP	Original Gas in Place
OHV	off-highway vehicle
OSHA	Occupational Safety and Health Administration
PAH	polynuclear aromatic hydrocarbons
P & A	plugged & abandoned
PFC	proper functioning condition
POD	Plan of Development
POM	polycydic organic matter
PPP	pollution prevention plan
PM_{10}	Particulate Matter less than 10 microns
$PM_{2.5}$	Particulate Matter less than 2.5 microns
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
RF	Recovery Factor
RFD	reasonably foreseeable development
RFFA	reasonably foreseeable future activities
RFO	Rawlins Field Office
RIP	Range Improvement Project

LIST OF ABBREVIATIONS/ACRONYMS

RMP	Resource Management Plan
ROD	Record of Decision
ROW	Right-of-Way
RPM II	Reactive Plume Model
RSFO	Rock Springs Field Office
RUSLE	Revised Unified Soil Loss Equation
RV	recreational vehicle
SARA	Superfund Amendments and Reauthorization
SCRAM	Support Center for Regulatory Air Models
SCR 23	Sweetwater County Road 23
SCS	Soil Conservation Service
SDVC	Spatial Data Visualization Center
SEO	State Engineer's Office
SHPO	State Historic Preservation Office
SO_2	Sulfur Dioxide
SPCC	Spill Prevention Control and Countermeasures
SSF	spring/summer/fall
SVR	Standard Visual Range
SWR	severe winter relief
SWYTAF	Southwest Wyoming Technical Air Forum
t/ac	tons per acre
t/ac/yr	tons per acre per year
t/y	tons per year
T & E	Threatened and Endangered
TCF	trillion cubic feet
TDS	total dissolved solids
TEG	triethylene glycol
TP	transportation plan
TPQ	threshold planning quantity
TSP	total suspended particulate
μeq/l	microequivalent/liter
UGBMA	Upland Game Bird Management Area
UPRC	Union Pacific Resources Company
URA	Unit Resource Analysis
URR	Unrecoverable Reserves
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USGS	United States Geological Survey
USLE	Universal soil loss equation
VBPA	Vermillion Basin Project Area
VOC	volatile organic compounds
VRM	Visual Resource Management
WAAQS	Wyoming Ambient Air Quality Standards
WAS	Western Archaeological Services
WDAI	Wyoming Department of Administration and Information
WDE	Wyoming Department of Employment
WDEQ	Wyoming Department of Environmental Quality
WGFD	Wyoming Game and Fish Department
WIN	winter
WOGCC	Wyoming Oil and Gas Conservation Commission
WOS	Wildlife Observation System
WRCC	Western Regional Climate Center
WRDS	Water Resource Data Center
WSA	Wilderness Study Area
WSGS	Wyoming State Geological Survey
WTPA	Wyoming Taxpayers Association
WYL	winter/yearlong
WYNDD	Wyoming Natural Diversity Database
WYO 789	Wyoming State Highway 789
YL	yearlong

CHAPTER 1

PURPOSE AND NEED

CHAPTER 1

PURPOSE AND NEED

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION AND LOCATION

1.1.1 Description

The Desolation Flats Project Area (DFPA) natural gas producing operators, including Marathon Oil Company, Yates Petroleum, AEC Oil & Gas (USA) Inc., EOG Resources, Inc, Tom Brown, Inc., Basin Exploration, Inc., Questar Exploration and Production Company, Merit Energy Company, and Devon SFS Operating, Inc., (hereafter referred to as "the Operators"), have notified the Bureau of Land Management (BLM) that the Operators intend to drill and develop natural gas wells in the DFPA of south central Wyoming (Figure 1-1). The proposed exploration and development wells, access roads, pipelines, and other ancillary facilities located on federal land, including split estate (e.g., state or private surface ownership with federal mineral ownership, or federal surface ownership with state or private mineral ownership), would be permitted with the BLM and the Wyoming Oil and Gas Conservation Commission (WOGCC). Facilities located on State of Wyoming and privately owned surface would be permitted with the WOGCC.

1.1.2 Location

The DFPA is generally located in Townships 13 through 16 North and Ranges 93 through 96 West in Carbon and Sweetwater counties, Wyoming as shown on Figure 1-1. The DFPA is located approximately 21 miles south of Wamsutter, Wyoming and approximately 14 miles west of Baggs, Wyoming.

Access to the DFPA is provided by the two-lane paved WYO 789 from Interstate 80 (I-80) at Creston Junction south to the intersection with Carbon County Road 608 ("Wamsutter/Dad Road") as shown on Figure 1-2. Access is also provided south from Wamsutter on Carbon County Road 608. Access to the interior of the project area is provided by an existing road network developed to service prior and on-going drilling and production activities. These roads include the Barrel Springs Road, the Eureka Headquarters Road, the South Barrel Springs Road, the Shell Creek Stock Trail Road, and the Standard Road (Figure 1-2).

The location of the DFPA is more specifically described as follows: commencing at the center of Township 16 North, Range 96 West and ending in Township 16 North, Range 94 West, the northern boundary of the DFPA is determined by the southern boundary of the Continental Divide/Wamsutter II Environmental Impact Statement (EIS) project area. From that point through Township 14 North, Range 93 West, the eastern boundary is determined by the western limits of the Creston/Blue Gap EIS project area. The southeast corner of the proposed area includes the existing McPherson Springs Field and EOG Resources' Cedar Chest Unit but excludes all of Township 13 North, Range 93 West due to a lack of existing production and proposed drilling activity.

The southern boundary is set at the north end of Township 12 North which corresponds with the north flank of a geologic structure, the Cherokee Arch. Township 12 North was excluded from the DFPA since it represents a structural play on the Cherokee Arch as opposed to the more Washakie

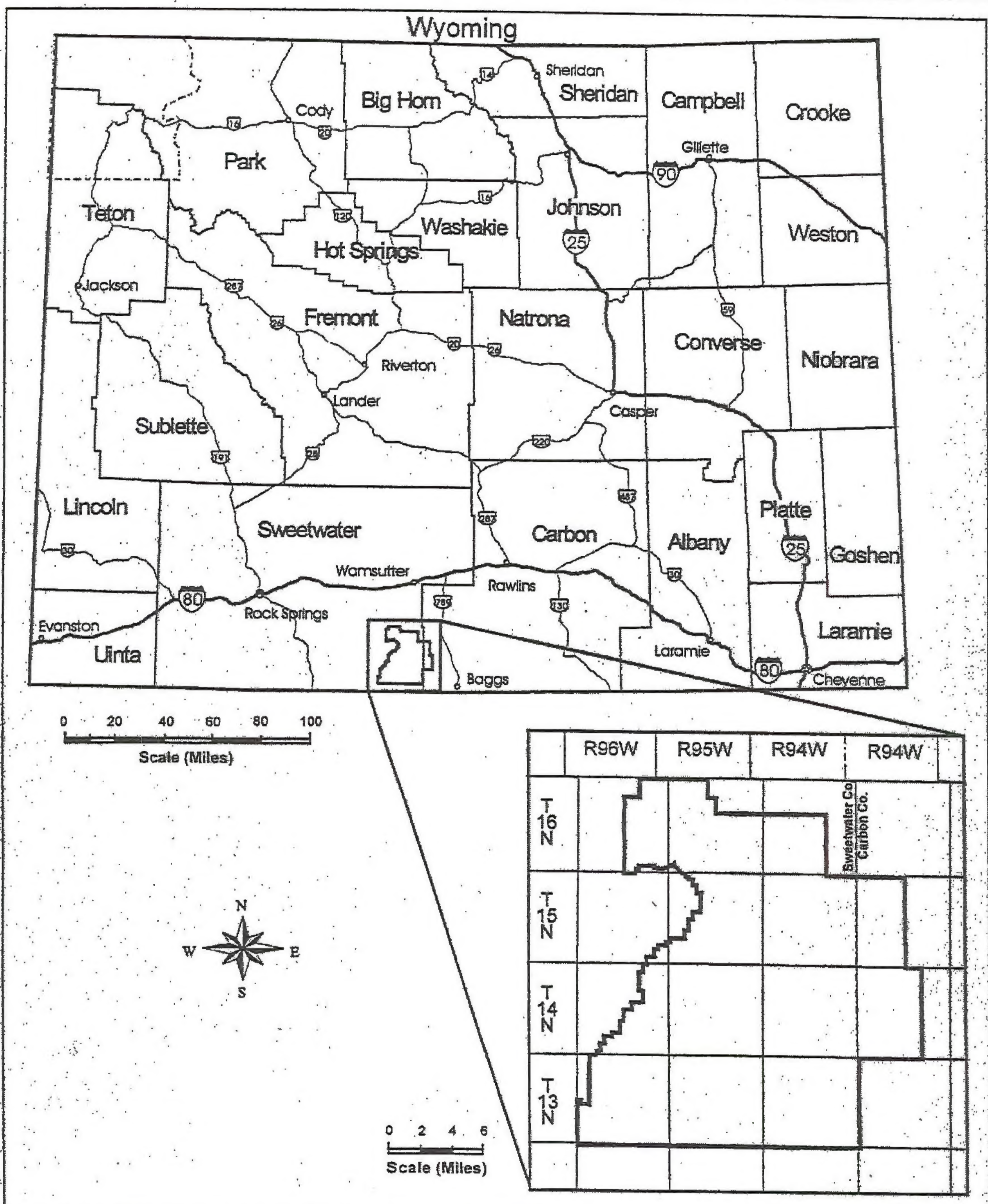


Figure 1-1. Location of the Desolation Flats Project Area in Southcentral Wyoming.

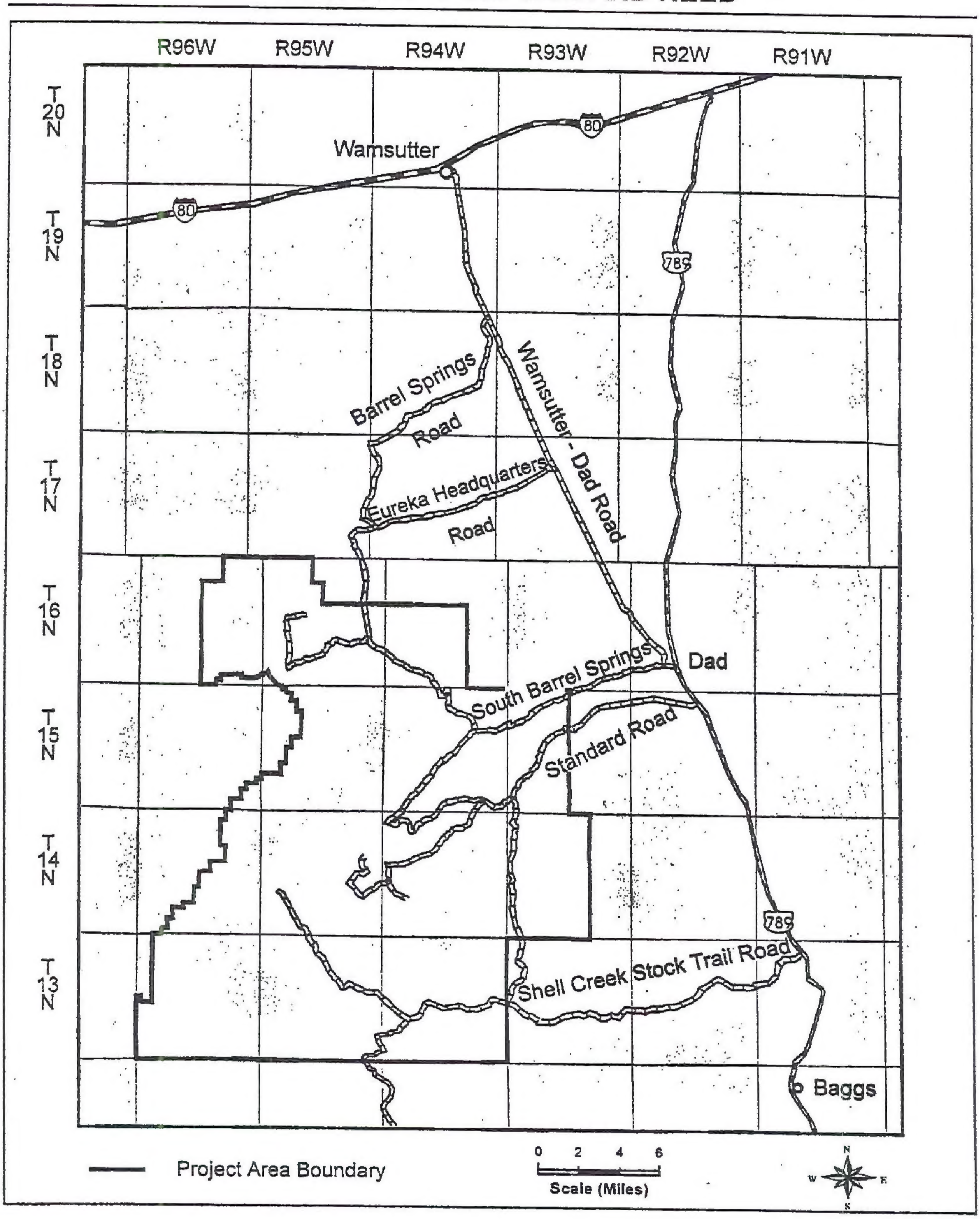


Figure 1-2. Location and Names of Roads Commonly Used by Industry in and around the Desolation Flats Project Area.

Basin centered plays (i.e., oil and gas exploration and development) in the DFPA. The western boundary of the DFPA is determined by the eastern limits of the Adobe Town Wilderness Study Area (WSA). The Adobe Town WSA also coincides with the deepest portion of the Washakie Basin where the target reservoirs are too deep for development with conventional technology and current market conditions.

1.1.3 Project Background

The DFPA includes the recent drilling activity by Marathon Oil Company, EOG Resources, Inc., Tom Brown, Inc., Basin Exploration, Inc., and Questar Exploration & Production Company as well as other minor oil and gas activity in the overall area. The DFPA is bounded on two sides by existing EIS documents (Continental Divide/Wamsutter II EIS and the Creston/Blue Gap EIS). The previously approved Mulligan Draw EIS and Dripping Rock Unit/Cedar Breaks EA (both project areas located within the DFPA) are included in the proposed Desolation Flats EIS for analysis of the potential for increased well density.

The DFPA consists of several natural gas production fields. These fields are predominantly spaced for one or four wells per section depending on the field. The field name, operator(s), and status of drilling activity within the fields are summarized in Table 1-1 and shown on Figure 1-3.

Table 1-1. Natural Gas Fields within the DFPA.

Field Name	Operator(s)	Producing Wells	Shut-in Wells	Total Wells
Willow Reservoir	Questar Exploration	1	0	1
Mulligan Draw/Wedge	Questar Exploration True Oil Company	14	1	15
Powder Mountain/ Polar Bar	Basin Exploration EOG Resources	6	2	8
Desolation Flats	Marathon Oil Company	0	1	1
Ruger	EOG Resources	2	1	3
Dripping Rock	Questar Exploration Marathon Oil Company	11	1	12
Cedar Chest	EOG Resources	3	2	5
Triton	Tom Brown Inc.	4	0	4
Lookout Wash	Cabot	3	0	3
Hangout Ridge	Devon Energy	1	0	1
McPherson Springs	Windsor	1	2	3
Windmill Draw	Xeric Oil and Gas Corp.	3	1	4
CEPO	EOG Resources	2	0	2
Rim Unit	San Marco Petroleum	1	0	1

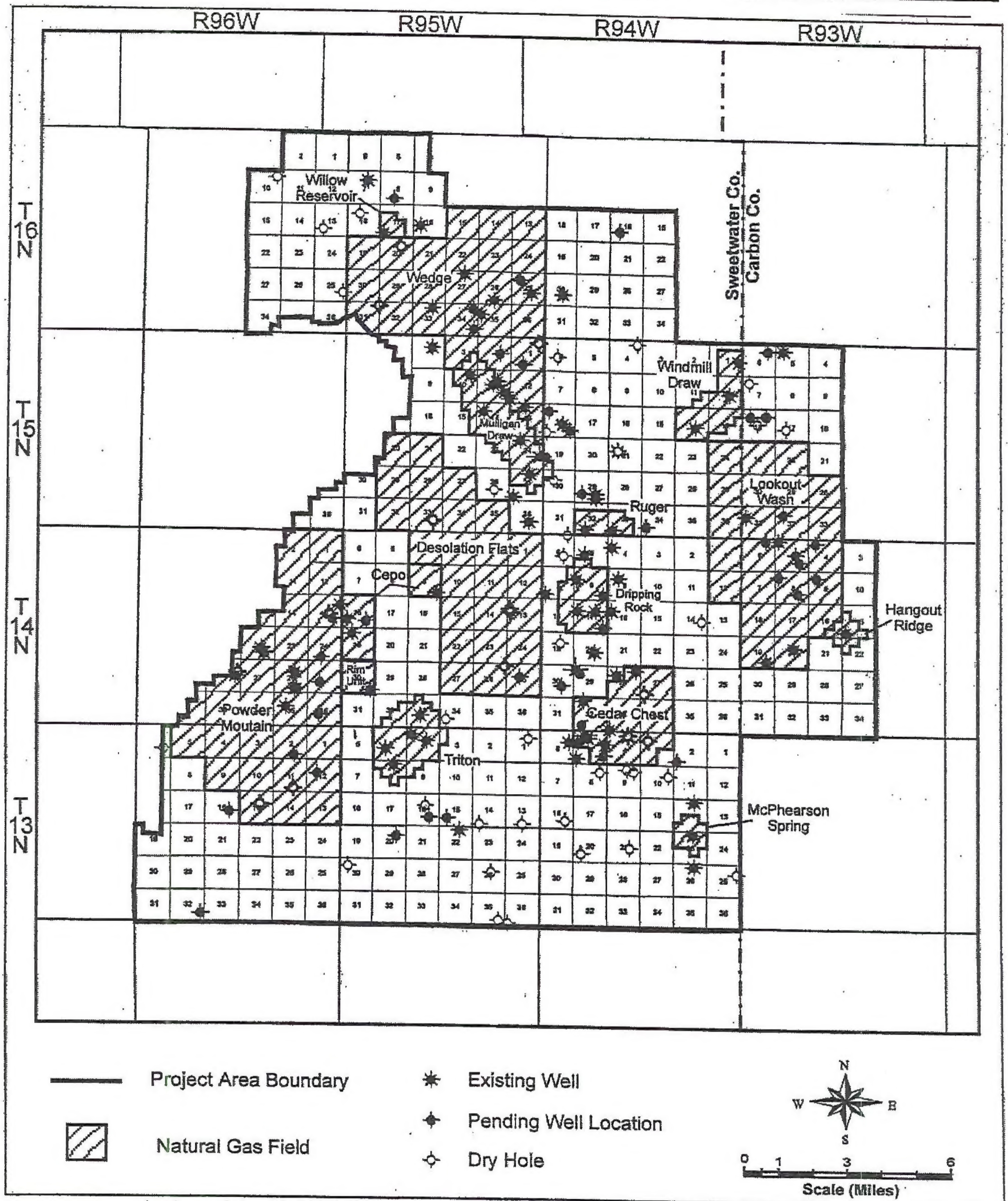


Figure 1-3. Location of the Natural Gas Fields and Well Locations within the Desolation Flats Project Area in Carbon and Sweetwater Counties, Wyoming.

Also, as shown on Figure 1-3, existing natural gas development is concentrated within and near the natural gas fields listed in Table 1-1. The existing network of roads (developed and undeveloped) within the DFPA is illustrated in Figure 1-4 and contains an estimated 126.1 miles of primary roads, 132.9 miles of secondary roads and 402 miles of two-track roads. The Operators anticipate that future development in the DFPA would likely be concentrated within and near existing fields rather than in outlying areas where development currently does not exist.

1.1.4 Land Status

The project area encompasses approximately 233,542 acres of mixed federal, state, and private lands. Of this total, approximately 224,434 acres are federal, 2,335 acres are State of Wyoming, and 6,773 acres are private lands. Surface ownership within the project area is summarized in Table 1-2. Mineral ownership is summarized in Table 1-3. Surface and mineral ownership are shown on Figure 1-5.

Table 1-2. Surface Ownership of the Desolation Flats Project Area.

Surface Ownership	Acres	Percent
Federal (BLM)	224,434	96.1
State of Wyoming	2,335	1.0
Private (Fee)	6,773	2.9
Total	**233,542**	**100.0**

Table 1-3. Mineral Ownership of the Desolation Flats Project Area.

Mineral Ownership	Acres	Percent
Federal (BLM)	212,611	91.0
State of Wyoming	14,271	6.1
Private (Fee)	6,660	2.9
Total	**233,542**	**100.0**

1.2 PURPOSE OF AND NEED FOR ACTION

1.2.1 Purpose and Need for the Proposed Action

Exploration and development of federal oil and gas leases by private industry is an integral part of the BLM's oil and gas program under authority of the Mineral Leasing Act of 1920 as amended, the Mining and Minerals Policy Act of 1970, the Federal Land Policy and Management Act of 1976, the

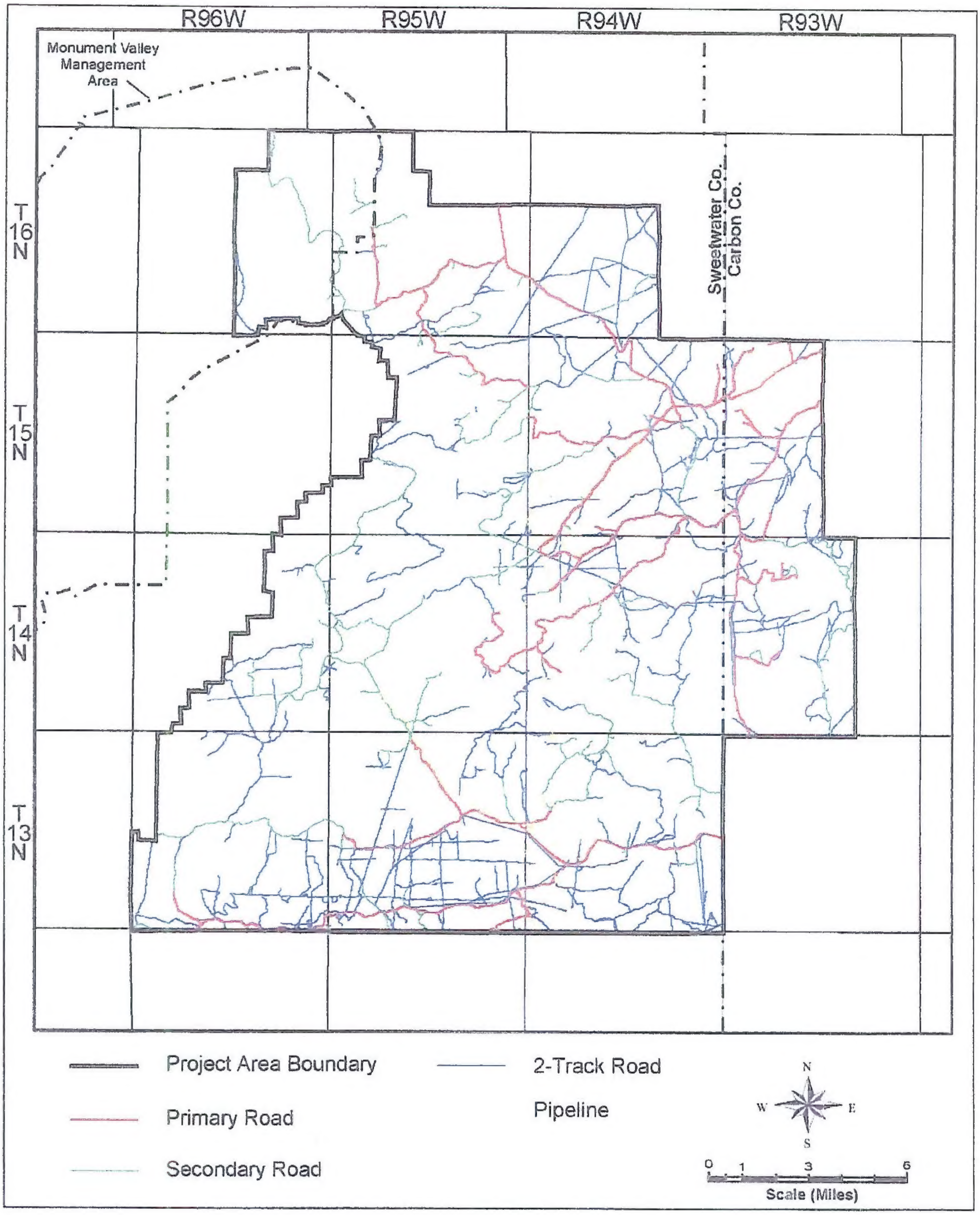


Figure 1-4. Existing Developed and Undeveloped Roads within the Desolation Flats Project Area.

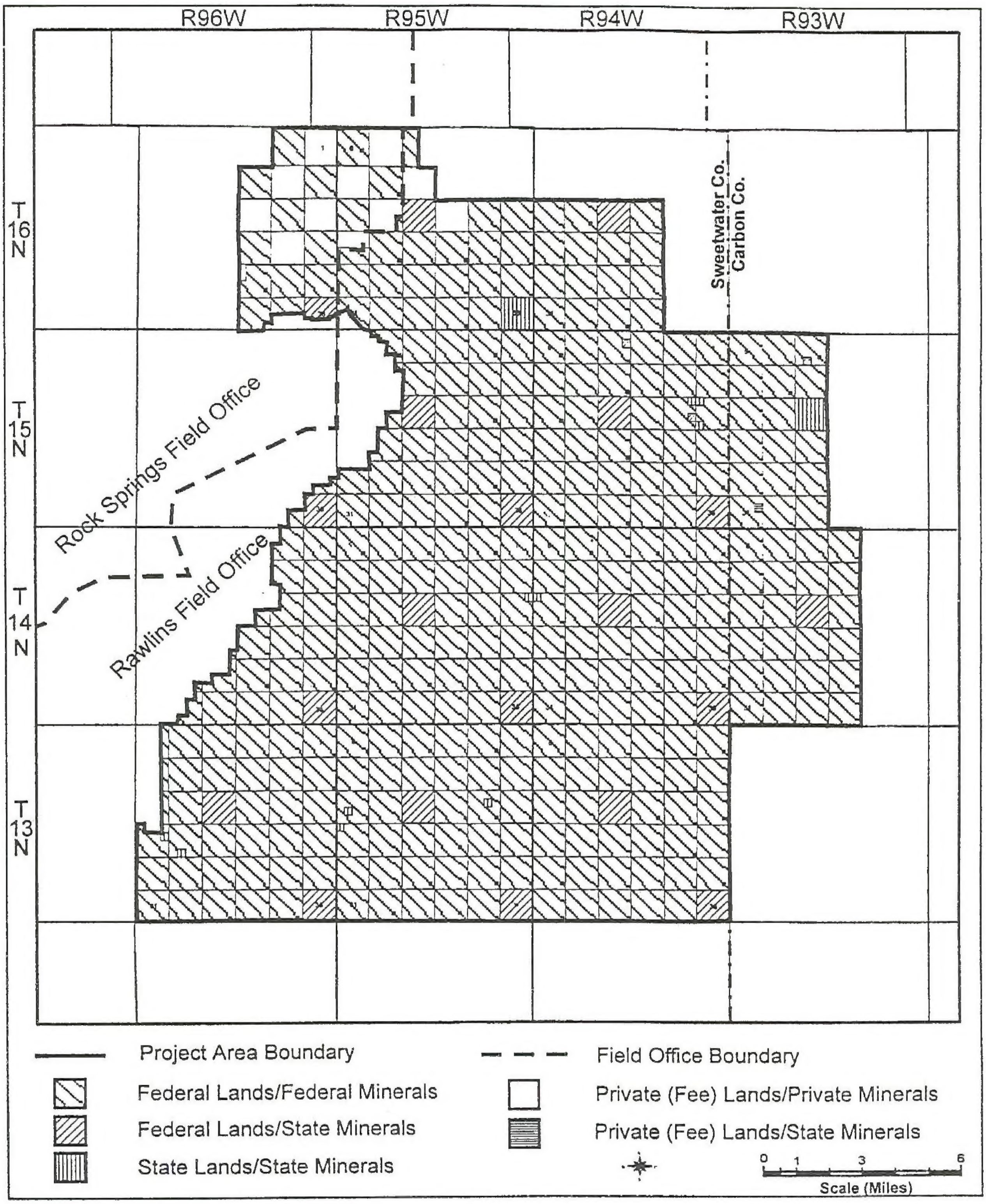


Figure 1-5. Surface and Mineral Ownership within the Desolation Flats Project Area.

National Materials and Minerals Policy, Research and Development Act of 1980, and the Federal Onshore Oil and Gas Leasing Reform Act of 1987.

The BLM oil and gas program encourages development of domestic oil and gas reserves. Natural gas is an integral part of the United States' energy future due to its availability and the presence of the existing market delivery infrastructure. By developing domestic reserves of clean burning natural gas, the U.S. would reduce dependence on foreign energy, such as natural gas from Mexico and Canada. The environmental advantages of burning natural gas rather than oil or coal were emphasized by the U.S. Congress and the President when the Clean Air Act Amendments of 1990 were signed into law.

The National Petroleum Council (NPC) was formed in 1946 to advise, inform and make recommendations to the Secretary of Energy on any matter requested by the Secretary relating to oil and natural gas and the oil and natural gas industries. In December 1999, the NPC issued a report titled *Natural Gas: Meeting the Challenges of the Nation's Growing Natural Gas Demand* (NPC 1999). The report projects that U.S. natural gas consumption will increase 32 percent between 1998 and 2010. This would constitute a 7 trillion cubic foot (TCF) increase, from the 1998 level of 22 TCF to 29 TCF in 2010. Much of the incremental demand is projected for use in the generation of electricity.

To meet this growing demand, the report projects that U.S. domestic gas production would increase from the 1998 level of 19 TCF to 25 TCF in 2010. The remaining demand would be met by imports of foreign natural gas, primarily from Canada. About 14 percent of this increase in domestic supply is anticipated to come from the Rocky Mountain region. Production from the DFPA could help meet this demand.

The Operators propose to develop the natural gas resources within the project area by increasing the total number of wells (i.e., increasing the well density) and ancillary facilities where economically feasible. This proposal would enhance recovery of natural gas from the project area, thus allowing all operators to provide more natural gas to companies distributing and supplying natural gas to consumers, and would benefit consumers by making natural gas supplies available.

The proposed natural gas development would allow the lease holders to exercise their rights within the project area to drill for, extract, remove, and market natural gas products. Also included is the right of the Desolation Flats area lease holders to build and maintain necessary improvements, subject to renewal or extension of the lease or leases in accordance with the appropriate authority.

1.2.2 Purpose of the Environmental Analysis Process

Drilling attempts within the DFPA have been successful. This has resulted in a request to the BLM by the Operators for an increase in drilling and production activity within the DFPA. The BLM has advised the Operators that an EIS would be required in view of the Operators' plans to drill additional exploratory and in-fill locations and construct ancillary facilities at levels not analyzed in previous environmental analyses.

The purpose of this EIS is to provide the decision-makers with information needed to make a final decision that is fully informed and based on factors relevant to the proposal. It also documents analyses conducted on the proposal and alternatives in order to identify environmental impacts and mitigation measures necessary to address issues. The EIS also provides a vehicle for public

review and comment on the Proposed Action and its alternatives, the environmental analysis, and conclusions about the relevant issues.

This EIS analyzes the effects of well pad locations, access roads, production facilities, pipelines, and other facilities associated with natural gas development on resources and land use within the project area.

1.2.3 Decision to be Made

The decision to be made for this project is whether: to implement the Proposed Action and the alternatives described above; to implement alternative actions to accomplish the purpose and need for action; or to defer any action at this time until a clearer, more definable full field development scenario is presented by the Operators.

1.3 ENVIRONMENTAL ANALYSIS PROCESS

The BLM, as directed by the Council on Environmental Quality (CEQ) and the National Environmental Policy Act (NEPA) regulations (40 CFR, Parts 1500-1508), analyzes actions involving federal leases as to their impact on the human environment. The analysis is to determine whether approval of the action would result in unnecessary or undue degradation of the land. The analysis uses an accepted process for evaluating and disclosing the potential environmental consequences of the proposed action and alternatives.

The BLM is the lead agency responsible for preparation of this EIS. The evaluation of this proposal and alternatives was developed through interdisciplinary field review with representatives from the Operators, the BLM, and the project contractor interdisciplinary team (IDT).

Factors considered during the environmental analysis process regarding the natural gas development project include the following:

- The location of environmentally suitable well pad locations, access roads, pipelines, and other production and ancillary facilities that best meet other resource requirements and minimize surface resource impacts yet honor the lease rights within the project area.

- A determination of impacts resulting from the proposed action and alternatives on the human environment, when conducted in accordance with applicable regulations and lease stipulations, and the development of mitigation measures necessary to avoid or minimize these impacts.

This EIS is *not* a decision document. The decision regarding the project will be documented in a Record of Decision (ROD) signed by the BLM State Director, Cheyenne, Wyoming. The BLM's decision will relate primarily to public lands and federal minerals administered by the BLM. Decisions by other jurisdictions to issue approvals related to this proposal may be aided by the disclosure of impacts available in this analysis.

This EIS will guide the implementation of a selected alternative and will facilitate preparation of additional environmental analyses within the DFPA and adjacent lands. Prior to surface disturbance on some drill sites and associated roads, pipelines, and ancillary facilities located on federal surface or federal minerals, additional site-specific analyses may be required.

1.4 RELATIONSHIP TO POLICIES, PLANS, AND PROGRAMS

The DFPA is located within the administrative boundaries of the Rawlins Field Office (RFO) and Rock Springs Field Office (RSFO) areas as shown on Figure 1-5. Approximately 94 percent of the DFPA is located within the RFO area, with the remaining 6 percent located within the RSFO. The

documents that direct management of federal lands within these areas, the Great Divide Resource Management Plan (RMP) and the Green River RMP are summarized in the following sections.

1.4.1 Great Divide Resource Management Plan

The document which directs management of federal lands within the DFPA located within the RFO administrative area is the ROD and approved Great Divide RMP (USDI-BLM 1987, 1988a,1990a).

1.4.1.1 Management Objectives

Management objectives in the Great Divide RMP applicable to the proposed action and alternatives within the RFO administrative area are as follows:

- To provide opportunity for leasing, exploration, and development of oil and gas while protecting other resource values.

1.4.1.2 Management Actions

Management actions applicable to the proposed action and alternatives within the RFO administrative area are as follows:

- The entire planning area is open to oil and gas leasing. Leases will be issued with needed restrictions to protect resources.

1.4.1.3 Conformance with Great Divide RMP Direction

The Great Divide RMP (USDI-BLM 1987, 1988a, 1990a) projected a planning period of 20 years, and data used in the RMP analyses for oil and gas development was compiled through 1985. Monitoring and tracking of well development since the completion of the RMP are continuing. BLM initiation of an RFO administrative area land use plan review and possible amendment will occur prior to reaching the reasonably foreseeable development (RFD) estimates made in the current RMP, and the BLM will not authorize oil and gas development actions (APD's, ROW's) that exceed current RFD estimates prior to the plan review and possible amendment.

The recent interest in coalbed methane (CBM) exploration and development within the RFO has increased the concern over the RFD scenario presented in the Great Divide RMP. The RFO, through the development of the Continental Divide/Wamsutter II (CD/WII) Natural Gas Development Project EIS developed a rationale that supported the CD/WII project at a reduced well count in the ROD and at the same time retained a sufficient part of the RFD to cover the Desolation Flats Natural Gas Development Project and future activity in other areas of the RFO. Recent CBM activity has added enough wells to the total count to require that BLM revisit the earlier RFD rationale presented in the CD/WII document. The following is a summary of oil and gas activity within the RFO administrative area.

The CD/WII Draft EIS (USDI-BLM 1999a) describes the current situation within the RFO until 1998 (see pages 1-8 and 1-9 of the CD/WII DEIS). BLM conducted a review of oil and gas production data and arrived at 1145 wells drilled within the RFO (includes abandoned (ABD) and plugged and abandoned [P&A] wells) since the Great Divide RMP analysis was initiated in 1985. The addition of the abandoned wells was included to account for wells that were not reclaimed as of the date of the count. BLM feels the 1145 well number is not completely accurate since it is highly likely that many of the abandoned wells have been reclaimed since 1985. Also, the disturbance figures included in the 1985 RMP analysis for oil and gas that were used in the CD/WII DEIS analysis included both a short term disturbance figure as well as a long term disturbance figure. The CD/WII analysis relied on the long term figures to calculate the existing disturbance and future disturbance covered by the existing RFD. Since the CD/WII analysis used only long term disturbance, the plugged and abandoned wells should not have been included in the well count as it is assumed that in the long term all P&A wells are, by definition, reclaimed.

A review of the WOGCC data base on December 31, 2001 showed a total of 2310 wells in the RFO that are considered active (this includes dormant wells [68], completed wells [2105], and spuds [137] within the RFO). The number of spuds includes those wells where APDs are approved and notice has been received that drilling has been initiated, but there is no record of the wells being completed or plugged and abandoned. The number of spuds is a conservative figure because not all spudded wells are going to be productive. The total count of 2310 wells goes back to the beginning of oil and gas production within the RFO in the late 1800s, early 1900s. From the Great Divide RMP EIS (Assumptions for Analysis, Chapter 4, page 220) a determination of the number of wells existing at the time the RMP Draft EIS (USDI-BLM 1987) was developed can be made. A summary provided in the RMP DEIS stated there were 3671 wells drilled in the planning area on all ownerships, and of these, 1896 wells were dry and abandoned. That left 1775 wells (3671 minus 1896) active prior to the RMP. Subtracting this figure from the 2310 wells currently in the RFO according to the WOGCC (Table 1-4) leaves 535 active producing wells since the RMP EIS.

Table 1-4. Well Status Summary - Rawlins Field Office (RFO) as of 12/31/01

Well Description	Federal	Fee or State	Total
Number of Plugged and Abandoned Wells Within RFO	1969	805	2774
Number of Dormant Wells Within RFO	38	30	68
Number of Completed Wells Within RFO	997	1108	2105
Number of Monitoring Wells Within RFO	3	0	3
Notice of Intent to Abandon Within RFO	48	39	87
Number of Spuds Within RFO	85	52	137
Number of Expired Permits Within RFO	252	173	425
Number of Permits to Drill Within RFO	104	53	157
Total Within the RFO	3496	2260	5756

To convert the current well number (535) to acres disturbed, the well number was multiplied by the average acres disturbed per well in the CD/WII project area. The CD/WII disturbance figure was used because it is the most current available data and part of the CD/WII RMP conformance

section of the CD/WII Draft EIS. Therefore, 535 wells x 9 acres disturbed per well = 4815 acres of total long term disturbance.

Currently there are 7 oil and gas project development environmental analyses in the RFO where drilling and production activities are authorized but not yet completed. These wells and associated disturbances need to be considered before a determination of the number of wells remaining under

the RFD scenario described in the RMP can be made. See Table 1-5 for a summary of the oil and gas development projects with wells authorized but not yet drilled.

Table 1-5 shows that approximately 1353 wells and 4224 acres of disturbance remain to be completed under existing authorizations for these projects. The well count for wells remaining to be drilled was taken from WOGCC data and the cumulative impact analysis presented in the Draft EIS for the Pinedale Anticline Oil and Gas Exploration and Development Project, Sublette County, Wyoming, page 5-3 (USDI-BLM 1999b). The Pinedale Anticline DEIS cumulative analysis included all wells in southwest Wyoming and was completed as part of a plan review for the Pinedale RMP.

Table 1-5. Disturbance Figures for Existing Oil and Gas Development NEPA Documents.

Project Title	Wells Remaining to be Drilled	Average Disturbance per Well (Acres)	Future Authorized Disturbance (Acres)
Mulligan Draw	23	6.5	149.5
Creston/Blue Gap	207	2.23	461.6
Dripping Rock/Cedar Breaks	34	18.69	635.5
Sierra Madre	16	1.95	31.2
Hay Reservoir	2	4.43	8.9
Continental Divide/ Wamsutter II	1031	2.77	2855.8
South Baggs	40	2.03	81.2
Total	1353		4224

The total disturbance then for existing and authorized (but not yet drilled) wells is 4815 acres plus 4224 acres = 9039 acres of disturbance either existing or authorized.

The RMP productive life of plan is 20 years (1986-2005). RFD data used in the RMP was collected in 1986 and therefore is used as the comparison of pre-RMP and post RMP well disturbance calculations. Reclamation was assumed to take from 3-5 years in the RMP. Therefore, it can be assumed that most wells drilled before 1996 should be adequately reclaimed.

Reasonably foreseeable development for oil and gas activity within the RFO administrative area as described in the Great Divide RMP (BLM 1988a) is projected to include 1440 new wells (16,092 acres of long-term disturbance) over a 20-year period (1986-2005). As stated above, 9039 acres of disturbance are either existing or authorized within the RFO. Long-term disturbance acreage

available for future projects within the RFO area would be 7053 acres (16,092 acres minus 9039 acres).

The Operators have indicated that approximately 385 wells at 361 well locations, with a forecasted success rate of 65 percent (250 producing wells) may be drilled in the DFPA. The Operators anticipate that 237 of the 250 producing wells would be located within the RFO, with the remaining 13 wells located within the RSFO area. The long-term disturbance acreage projection for the

DFPA is 2029 acres (237 wells with an average of 8.56 acres of long-term disturbance per well). This is 5024 acres (587 wells) less than the long-term acreage available within the RFO. Therefore, the reasonably foreseeable development estimate of the number of future oil and gas wells and associated long term disturbance within the RFO would not be exceeded by this project.

The DFPA natural gas development is in conformance with management objectives provided in the ROD and approved Great Divide RMP (USDI-BLM 1990a), subject to implementation of prescribed mitigation measures proposed by the Operators and BLM required mitigation in Chapter 2, and mitigation measures derived through analysis of impacts in Chapter 4, Environmental Consequences.

1.4.2 Green River Resource Management Plan

The document which directs management of federal lands within the DFPA located within the RSFO administrative area is the ROD and approved Green River RMP (USDI-BLM 1992a, 1996a, and 1997).

1.4.2.1 Management Objectives

Management objectives applicable to the proposed action and alternatives within the RSFO include:

- The objective for management of oil and gas resources is to provide for leasing, exploration, and development of oil and gas while protecting other values.

1.4.2.2 Management Actions

Management actions applicable to the proposed action and alternatives within the RSFO include:

- BLM-administered public lands not specifically closed are open to consideration of oil and gas leasing with appropriate mitigation measures.

A segment of the Monument Valley Management Area (MVMA) is located within the DFPA. The MVMA has unique scenic features and has high potential for significant cultural and paleontological resources. Designation of the area as an Area of Critical Environmental Concern (ACEC) is being deferred by BLM until a determination can be made that specific resources meet the ACEC relevance and importance criteria.

The management objective for the MVMA is to provide protection of wildlife, geologic, cultural, watershed, scenic, and scientific values (paleontological and cultural).

The MVMA is open to: (1) consideration for mineral leasing, exploration, and development provided mitigation can be applied to retain the resource values; (2) consideration for mineral material sales with the appropriate constraints applied to all surface disturbing activities; and (3) development and public use with necessary consideration for wildlife, raptors, cultural, watershed, and scientific values. The MVMA is a priority area for future cultural and paleontological inventory. A paleontological survey is required prior to surface disturbing activities. Surface disturbing activities within the MVMA, including rights-of-ways, will be managed to avoid slopes greater than 25 percent and highly erosive areas unless a plan can be developed to mitigate adverse effects to the resource values. Appendix A contains BLM guidance criteria for preparing mitigative plans for any surface disturbing activity proposed in the Rock Springs portion of the DFPA.

Drilling in a portion of the MVMA was analyzed in the Mulligan Draw EIS (USDI-BLM 1992b). This document was completed in September 1992 and provided an analysis of a planned natural gas production project on public lands located within the Mulligan Draw Field area. The ROD authorized the Mulligan Draw operators to drill and develop a maximum of 45 wells on 640-acre spacing.

1.4.2.3 Conformance with Green River RMP

Reasonably foreseeable development for oil and gas activity within the RSFO as described in the Green River RMP/EIS is projected to include approximately 1,300 new wells (9,985 acres of long-term disturbance) over a 20-year period (1990-2010). Currently, 5 wells have been drilled within the RSFO part of the DFPA. Four of these wells have been plugged and abandoned, and one well located on private land is producing. The level of development within the RSFO area required for the DFPA as identified in this EIS includes a maximum of approximately 13 new well locations and approximately 111 acres of new long-term disturbance (1.1% of the RSFO project development total) in addition to existing development.

Therefore, the proposed project is within the reasonably foreseeable estimates for future oil and gas development within the RSFO area. The proposed natural gas production project is in conformance with management objectives and actions provided in the Green River RMP and the decisions provided in the ROD for the Mulligan Draw Gas Field Project (USDI-BLM 1992b).

1.4.3 Relationship to Other Plans and Documents

1.4.3.1 Local Land Use Plans

NEPA requires consideration of local land use plans in the preparation of environmental analyses. The Proposed Action and alternatives to the Proposed Action for the Desolation Flats Natural Gas Development Project would occur entirely within Sweetwater and Carbon counties.

Sweetwater County has adopted Development Codes which include zoning ordinances, subdivision regulations and a growth management plan (Sweetwater County 1998). Except for a few isolated tracts, the portion of the DFPA in Sweetwater County falls within an Agriculture zoning district. Oil and gas wells and extraction facilities are permitted uses within agriculture zoning districts, however, certain permits are required (Kot 2000).

- <u>Mineral Development Permits</u> are required for the development of oil and gas wells and extraction facilities.

- Zone Changes are required when a proposed use is not permitted by the current zoning. Most oil and gas facilities are permitted in an agricultural zone, however, larger compressor stations and separation, processing, and bulk storage facilities require heavy industrial or mineral development zoning.

- Conditional Use Permits are required for temporary work camps and temporary construction yards or buildings.

- Construction and Use Permits are not required for wells and smaller facilities such as metering stations, distillate tanks and solar collectors, but are required for larger facilities such as compressor stations.

The Carbon County Board of Commissioners approved a land use plan on June 16, 1998 (Pederson Planning Consultants 1998). The Carbon County Land Use Plan recommends land areas between townships 12 and 26 and ranges 86 through 93 as suitable for potential oil and gas exploration, processing and transportation. The Carbon County portion of the DFPA is located within this area. Conditional use and construction and use permits may also be required for the development of certain oil and gas facilities in Carbon County.

Based on the foregoing, the Desolation Flats Natural Gas Development Project would be in conformance with Sweetwater and Carbon county land use plans and development ordinances.

1.4.3.2 Greater Wamsutter Area II (GWA II) Natural Gas Development Project Environmental Impact Statement (USDI-BLM 1995)

An analysis of impacts associated with a maximum development pattern of 750 new production wells at 300 locations within the GWA II and associated access roads, pipelines, and other ancillary facilities required on federal lands was provided in the GWA II Natural Gas Project EIS. The GWA II project area is located north of the DFPA (Figure 1-6). The EIS also displayed the analysis of three other alternatives, including an alternative to develop 300 wells and 250 locations within the project area in addition to existing operations, an alternative to develop 225 wells and 200 locations in addition to existing operations, and the No Action alternative. See Figure 1-6 for other mineral development projects in the vicinity of the DFPA.

Development within the GWA II has reached the levels analyzed in the EIS for that project (i.e., 300 well locations). Since directional drilling has proven to be technically impractical or uneconomical in many areas within the GWA II project area, additional well locations beyond those analyzed in the GWA II EIS were required.

The expansion of development in the GWA II project area and development in the adjacent Continental Divide Area were combined into one analysis, the Continental Divide/Wamsutter II EIS. Disturbances and other impacts associated with the GWA II project are included in the DFPA EIS to fully evaluate potential cumulative impacts.

1.4.3.3 Continental Divide/Wamsutter II Natural Gas Development Environmental Impact Statement (USDI-BLM 1999a, 2000)

This natural gas development project includes the Continental Divide area combined with the GWA II area and is referred to as the Continental Divide/Wamsutter II Project Area (Figure 1-6). The combined project area is generally located in Townships 15 through 23 North, Ranges 91 through

99 West, in Sweetwater and Carbon counties, Wyoming. The total combined area encompasses approximately 1,061,200.

The scoping process for the Continental Divide Natural Gas Project was originally conducted in March 1995, and preparation of an EIS was initiated. Scoping for the GWA II Project was originally conducted in December 1993. The ROD for the combined Continental Divide and Wamsutter II natural gas production areas was signed in May 2000.

The Continental Divide/Wamsutter II EIS provides an assessment of environmental impacts associated with development of natural gas resources in the Continental Divide/Wamsutter II natural gas producing area (Figure 1-6). The project entails the development of natural gas resources beginning in May, 2000 and continuing for approximately 20 years, with a project life of 30 to 50 years. The ROD allows approximately 930 new wells/well locations within the jurisdictional boundaries of the RSFO (not more than 465 wells or well locations on federal lands and/or federal mineral estate), and allows 1,200 new wells/well locations within the jurisdictional boundary of the RFO area (not more than 600 wells or well locations on federal lands, and/or federal mineral estate) for a total of 2,130 well locations. (This authorization assumes 50% of the wells will be drilled on federal lands and/or federal mineral estate. If private/state land development trends exceed 50% of the authorized wells, the number of wells permitted on federal estate will be limited accordingly, unless federal mineral drainage is identified). Various associated facilities (e.g., roads, pipelines, power lines, water wells, disposal wells, evaporation ponds, compressor stations, etc.) would also be constructed. Impacts associated with this proposed development are included in the cumulative impacts analysis in the DFPA EIS.

1.4.3.4 Mulligan Draw Environmental Impact Statement (USDI-BLM 1992b)

This document was completed in September 1992 and provided an analysis of a planned natural gas production project on public lands located within the Mulligan Draw Field. The ROD authorized Celsius Energy Company and other operators to drill and develop a maximum of 45 wells on 640-acre spacing to develop the natural gas reserves in the Mulligan Draw field area. The Mulligan Draw project area is included within the proposed DFPA for analysis of the potential for increased well density. Approvals provided in the Mulligan Draw ROD will remain in effect until an ROD for the DFPA is completed.

1.4.3.5 Creston/Blue Gap Natural Gas Project Environmental Impact Statement (USDI-BLM 1994a)

This EIS was approved on October 4, 1994, and provided an assessment of the environmental consequences of a proposed natural gas development located east of the DFPA. The BLM's decision allowed a maximum of 275 wells on 250 locations on a 160-acre spacing pattern. Impacts associated with this proposed development will be included in the cumulative impacts analysis in the DFPA EIS.

1.4.3.6 Uinta Basin Lateral Pipeline Environmental Assessment (USDI-BLM 1992c)

This EA was completed in January 1992 and provided an analysis of impacts associated with construction and use of a 20-inch natural gas pipeline located west and north of the DFPA. Total length of the proposed pipeline is approximately 222 horizontal miles and would transport natural gas from various supply sources in the Uinta Basin of eastern Utah and the Piceance Basin of western Colorado to natural gas mainlines located near Wamsutter, Wyoming. Potential impacts

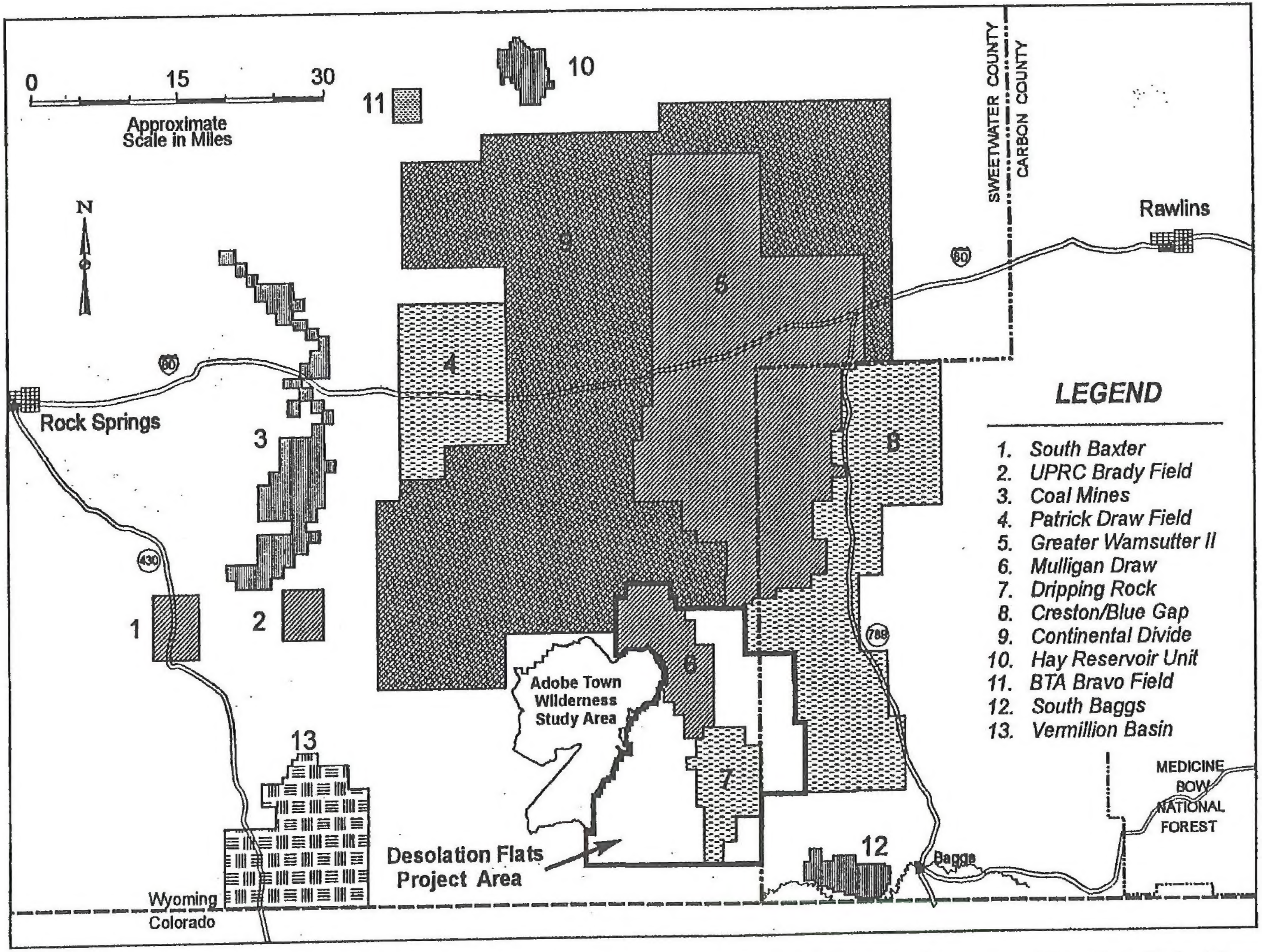


Figure 1-6. Location of other Mineral Development Projects and the Adobe Town WSA in relation to the Desolation Flats Project Area.

associated with construction and use of this project will also be included in the cumulative impacts analysis of the DFPA EIS.

1.4.3.7 Dripping Rock Unit/Cedar Breaks Area Field Development Environmental Assessment (USDI-BLM 1985)

This document was completed in April 1985 and provided an analysis of a planned natural gas production project on public lands located within the DFPA. The Decision Record (DR) authorized operators to drill and develop a maximum of 58 wells on 640-acre spacing with associated access roads and pipelines to develop the natural gas reserves in the Dripping Rock Unit/Cedar Breaks field area. Approvals provided in the Dripping Rock Unit/Cedar Breaks DR will remain in effect until an ROD for the DFPA is completed.

1.4.4 Wyoming BLM Guidelines for Surface-Disturbing and Disruptive Activities

Wyoming BLM guidelines for Surface-Disturbing and Disruptive Activities are incorporated into the oil and gas leases within the DFPA. The purposes of these guidelines are: (1) to reserve, for the BLM, the right to modify the operations of surface and other human presence disturbance activities for environmental protection, and (2) to inform a potential lessee of the requirements that must be met when using BLM-administered public lands. Standard mitigation guidelines applicable to the proposed natural gas production operations within the DFPA are presented in Appendix B.

1.5 AUTHORIZING ACTIONS

The proposed federal, state, county, and local actions required to implement the Desolation Flats Natural Gas Development Project are listed in Table 1-6.

1.6 ISSUES AND CONCERNS

Public issues and comments regarding the proposed natural gas development project were solicited for incorporation into this EIS through the scoping process. Scoping consisted of public notices and two formal public scoping meetings. Scoping measures conducted are summarized in Section 6.1 - Public Participation for this EIS. Environmental and social issues of local importance associated with natural gas production identified through the scoping process are summarized as follows:

1. Potential impact to geologic and paleontologic resources at all disturbed sites associated with natural gas production operations.

2. The potential for increased erosion resulting from access road, pipeline, and drill site construction activities, primarily on sensitive soils (e.g., those which are highly erosive such as red soils, calcareous soils, sand dunes, or sandy soils).

3. Potential impacts to the quality of surface and groundwater resources and wetland areas within the project area and adjacent lands.

4. Potential impacts to the air quality of the area resulting from dust and emissions created by construction and natural gas production activities.

Table 1-6. Federal, State, and County Authorizing Actions

AGENCY	NATURE OF ACTION
DEPARTMENT OF INTERIOR	
Bureau of Land Management (Rawlins Field Office/Rock Springs Field Office)	Approve Applications for Permit to Drill (APD's), Sundry Notices and Reports on Wells (sundry notices), production facilities, disposal of produced water, gas venting or flaring, and well plugging and abandonment for federal wells. Grant Right-of-Ways (ROW's) to Operators for natural gas field development actions on BLM surface outside of federal lease or unit boundaries, and to third party applicants (i.e., non-unit operator or non-lease holder), both within and outside of the unit boundary. Review inventories of, and impacts to cultural resources affected by undertakings, and consult with SHPO and ACHP. Review impacts on federally listed, or proposed for listing, threatened or endangered species of fish, wildlife, and plants, and consults with U.S. Fish and Wildlife Service. Grant Unit Area Agreement and subsequent actions relative to the unit.
(Casper Field Office - Reservoir Management Group)	Administers drainage protection and protection of correlative rights on federal mineral estate.
U.S. Fish and Wildlife Service	Reviews impacts on federally listed, or proposed for listing, threatened or endangered species of fish, wildlife, and plants.
DEPARTMENT OF THE ARMY	
U.S. Army Corps of Engineers	Issues permit(s) (Section 404) for placement of dredged or fill material in, or excavation of waters of the U.S. and their adjacent wetlands.
WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY	
Water Quality Division	Administers Storm Water Pollution Prevention Plan. Approves Surface Discharge. Approves wastewater and sewage disposal.

Table 1-6. Continued.

AGENCY	NATURE OF ACTION
WYOMING STATE ENGINEER'S OFFICE	
	Issues permits to appropriate groundwater and surface water. Issues temporary water rights for construction permits to appropriate surface water.
WYOMING STATE HISTORIC PRESERVATION OFFICE (SHPO)	
	Provides consultation concerning inventory of, and impacts to cultural resources
WYOMING OIL AND GAS COMMISSION	
	Acts as primary authority for drilling on state and privately held mineral resources, and secondary authority for drilling on federal lands. Holds authority to allow or prohibit flaring or venting of gas on private or state owned minerals. Regulates drilling and plugging of wells on private or state owned minerals. Approves directional drilling. Administers rules and regulations governing drilling units. Grants gas injection well permits. Administers drainage protection and protection of correlative rights on private/state mineral estate.
CARBON/SWEETWATER COUNTIES	
	Grant small wastewater system permits, where applicable. Issue driveway access permits where new roads intersect with county roads. Administer zoning changes where applicable. Prepare road use agreements and/or oversize trip permits when traffic on county road(s) exceeds established size and weight or where the potential for excessive road damage exists.

5. Possible adverse impacts to wildlife in the analysis area and adjacent lands, including the following:

    - Potential impacts to wildlife habitats within the project area and adjacent lands for sage grouse, raptors, prairie dogs, big game winter range, and non-game wildlife species.

    - Potential impact to threatened, endangered, and sensitive plant and animal species and communities.

6. Existing road and gas pipeline concerns:

    - Increased traffic and associated impacts on existing county, state, and BLM roads.

    - Utilization of existing road and pipeline corridors rather than construction of new ones (i.e., cumulative site disturbance effects resulting from additional road and pipeline construction within an existing corridor).

7. Potential impacts to known and unknown cultural and historic values within the project area.

8. Disruption of livestock management operations (primarily livestock distribution) and potential for loss of suitable range forage within the project area resulting from additional field development activities.

9. Reclamation of disturbed areas and control of invasive, non-native species invasions following reclamation.

10. Socioeconomic impacts to local communities resulting from project implementation and subsequent increased demand on local facilities and services.

11. Potential impacts associated with noise due to construction activities and natural gas production operations.

12. Cumulative impacts of natural gas in-field development relative to other land and resource activities in the area, both on-going and proposed.

13. Visual Resource Management (VRM), cultural, and paleontological concerns with drilling and production activities in the Monument Valley Management Area and lands adjacent to Monument Valley.

14. Potential impacts to recreation resources within the DFPA.

15. Potential impacts to the Adobe Town WSA, including the proposed natural gas development's effects on the WSA's suitability for wilderness designation.

1.7 OPPORTUNITIES

Opportunities that may arise from the Desolation Flats Natural Gas Production project include the following:

1. The natural gas development project would allow the Operators to continue development of both proven and unproven natural gas reserves.

2. Potential economic benefits to communities surrounding the project area by providing jobs and an increase in the local tax base.

3. The natural gas field development project could provide the opportunity to develop a domestic energy source that decreases dependence on foreign sources.

4. The field development project would provide a clean-burning energy resource that could supplement or replace some existing energy sources that are more harmful to the environment.

CHAPTER 2

PROPOSED ACTION AND ALTERNATIVES

CHAPTER 2

PROPOSED ACTION AND ALTERNATIVES

2.0 SUMMARY

The DFPA currently contains 63 active producing wells, with accompanying production related facilities, roads, and pipelines. The Desolation Flats Operators have proposed to drill approximately 385 wells at 361 well locations in addition to the 63 wells previously approved in the DFPA. Some of these wells would be classified as exploration/delineation wells because natural gas production potential has not been totally defined due to geological complexities. Other wells, where production potential is better known, would be classified as in-fill or development wells. The precise number of additional wells, locations of the wells, and timing of drilling associated with the proposed natural gas development project would be directed by the success of development drilling and production technology and economic considerations such as the cost of development of leases within the project area with marginal profitability. Drilling would typically occur at 2 to 4 wells per section where hydrocarbons are encountered. Development would likely occur sporadically and not be uniformly spaced throughout the DFPA. The Operators anticipate that future development in the DFPA would likely be concentrated within or near existing fields rather than in outlying areas where development currently does not exist.

Based on the planning information provided by the Operators and alternatives identified through the scoping process, this EIS addresses the Operators' Proposed Action, one alternative to the Proposed Action, and the No Action Alternative. The alternative selection process is discussed in the following section.

2.1 ALTERNATIVE SELECTION PROCESS

2.1.1 Proposed Action

The Proposed Action of drilling approximately 385 natural gas wells at 361 well locations, with a forecasted success rate of 65 percent (250 producing wells) was determined by summarizing drilling plans projected by the Desolation Flats Operators over the next twenty-year planning period. Drilling estimations were based on reasonably foreseeable spacing and drilling projections into areas within the project area where the planned production and development activities would occur. The drilling proposal is in addition to existing drilling and production operations. The Operators anticipate that 237 of the 250 producing wells would be located within the RFO administrative area, with the remaining 13 wells located within the Monument Valley Management Area (MVMA), RSFO administrative area.

The previously approved Mulligan Draw Project (Mulligan Draw EIS, USDI-BLM 1992b) is located within the DFPA and is included in the proposed Desolation Flats EIS for analysis of the potential for increased well density. A segment of the MVMA is located within the Mulligan Draw project area. Drilling in the portion of the MVMA located in the DFPA was analyzed in the Mulligan Draw EIS. The Mulligan Draw ROD authorized the Mulligan Draw operators to drill and develop a maximum of 45 wells on 640-acre spacing, therefore a maximum of 13 wells would be drilled within the MVMA portion of the project area.

Existing disturbance within the DFPA is approximately 1,506 acres, or 0.6 percent of the 233,542 acres comprising the project area. During the construction phase, the Proposed Action would disturb up to 4,923 acres. Disturbance areas within the DFPA would be reduced following reclamation of pipeline ROW's and unused portions of the drill pad and ancillary facility disturbances during the production phase. Under the Proposed Action, reclamation would reduce impacts to 2,139 acres for a total disturbance of 3,645.4 acres or 1.6 percent of the DFPA (Table 2-1).

Table 2-1. Types and Approximate Acreages of Existing and Proposed Surface Disturbance, Desolation Flats Natural Gas Project, Sweetwater and Carbon Counties, Wyoming, 2002.

Disturbance Type	Existing	Proposed Action		Alternative A		No Action Alternative	
		New	LOP	New	LOP	New	LOP
Wells Locations	90[1]	1440	336	2220	516	**	**
Roads	1128[2]	2624	1706	4035	2623	**	**
Pipelines	40	758	0	1166	0	**	**
Ancillary Facilities	–	97	97	161	161	**	**
Other Developments	249[3]	–	–	–	–	–	–
Subtotal	1506	4923	2139	7582	3300	**	**
Total Disturbance	–	6429	3645	9088	4806	**	**
Percent of DFPA	0.6	2.8	1.6	3.9	2.1	**	**

[1] 63 existing wells x 1.43 acres per well
[2] Existing roads network: primary roads (611 ac), resource roads (322 ac), 2-track roads (195 ac)
[3] Other developments minus allowance for the 63 existing wells
** Determined as APD's are granted

2.1.2 Alternatives to the Proposed Action

Alternatives to the Proposed Action, as determined from the scoping process and BLM management concerns, include a maximum development alternative and the No Action alternative. Alternatives to the Proposed Action are summarized as follows:

- Alternative A - Alternative A would consist of an increased density of surface well pads beyond that described in the Proposed Action to 592 natural gas wells at 555 locations in addition to 63 wells previously approved in the project area (see Section 2.3 of this EIS for a detailed description of Alternative A). Assuming a success rate of 65 percent, the Operators anticipate that 372 of the 385 new producing wells would be located within the RFO administrative area, with the remaining 13 wells located within the MVMA, RSFO administrative area. During the construction phase, Alternative A would disturb up to 7,582 acres. With Implementation of reclamation under Alternative A, impacts would be reduced to 3,300 acres for a total disturbance of 4,806.4 acres or about 2.1 percent of the DFPA (Table 2-1).

- Alternative B - No Action. Under this alternative, previously approved authorizations would remain in effect, including the Mulligan Draw natural gas project and the Dripping Rock Unit/Cedar Breaks oil and gas field development (Dripping Rock Unit/Cedar Breaks Oil and Gas Field Development EA and DR, USDI-BLM 1985). Alternative B may also allow Applications for Permit to Drill (APD's) and ROW actions to be granted by the BLM on a case-by-case basis through individual project and site-specific environmental analysis. Additional natural gas development could occur on State and private lands within the project area under APD's approved by the WOGCC (see Section 2.4 for a detailed description of Alternative B). Under Alternative B, additional surface disturbance would occur on a case-by-case basis. Coordinated, area-wide monitoring and protective plans (e.g, transportation, wildlife monitoring) would not be required under the No Action Alternative.

The Proposed Action and alternatives to the Proposed Action are discussed in detail in the following sections.

2.2 PROPOSED ACTION - DRILL 385 NATURAL GAS WELLS AT 361 WELL LOCATIONS WITHIN THE DESOLATION FLATS NATURAL GAS PROJECT AREA IN ADDITION TO EXISTING DRILLING AND PRODUCTION OPERATIONS

Accurately predicting the total number of wells and the timing of drilling operations is difficult due to the limited amount of natural gas exploration and the geological complexities in the DFPA. However, the Operators have indicated that approximately 385 wells at 361 well locations, with a forecasted success rate of 65 percent (250 producing wells at 235 well locations), may be drilled in the DFPA. This is in addition to 63 wells previously approved in the DFPA.

Development would begin in 2003 (subsequent to the release of the ROD) within the DFPA and continue for approximately 20 years, with a life-of-project (LOP) of 30-50 years. Various associated facilities (e.g., roads, pipelines, power lines, water wells, disposal wells, evaporation ponds, compressor stations, gas processing facility) would also be constructed throughout the DFPA. The Operators anticipate that 237 of the 250 producing wells would be located within the RFO administrative area, with the remaining 13 wells located within the MVMA, RSFO administrative area.

The DFPA would have a maximum of: 1,444 acres of new surface disturbance from well locations (including on-site gathering, measurement, and dehydration facilities); 542 miles (2,624 acres) of new roads or upgrades of existing roads, 361 miles (758 acres) of new pipeline and approximately 97 acres of new surface disturbance from ancillary facilities (i.e., 4 compressor stations [16 acres], one gas processing plant [30 acres], 3 water evaporation ponds [12 acres], 2 disposal wells [14 acres], and 10 water wells [25 acres]). Total new short-term surface disturbance resulting from the Proposed Action would be 4,923 acres (approximately 2.1 percent of the DFPA).

During the LOP (30-50 years), total disturbances would be reduced to 2,139 acres (336 acres associated with 235 wells having 1.43 acres of remaining disturbance per well site, 1,706 acres of roads [this assumes a 65 percent drilling success rate with roads to unsuccessful wells being reclaimed], and 97 acres of surface disturbance associated with ancillary facilities) or approximately 0.92 percent of the DFPA.

Specific components of the Desolation Flats Natural Gas Development program are discussed in the following sections. Additional site-specific proposal and resource information would be contained in the individual well APD and/or ROW applications when submitted to the BLM. Prior to surface disturbance on some drill sites and associated roads, pipelines, and ancillary facilities located on federal surface or federal minerals, additional site-specific analyses may be required.

2.3 ALTERNATIVE A - DRILL AND DEVELOP 592 NATURAL GAS WELLS AT 555 WELL LOCATIONS WITHIN THE DESOLATION FLATS NATURAL GAS PROJECT AREA IN ADDITION TO EXISTING DRILLING AND PRODUCTION OPERATIONS

National demand for natural gas is expected to increase during the LOP, as is the likelihood that increased natural gas prices would also occur. With increased realized profits by the oil/gas industry from such demand, the economic realm of new drilling and production technology would also expand. Those areas within the DFPA that are currently considered marginal properties from an economic standpoint by the DFPA Operators may become economically feasible to develop by industry in the future. Should attempts by the Operators to develop marginal properties within the DFPA be successful, then the level of drilling and production activity on marginal properties could potentially increase. In order to analyze for the potential increases in drilling activity in the DFPA beyond those levels described in the Proposed Action, Alternative A was developed for analysis in this EIS. Alternative A would consist of an increased density of surface well pads and production facilities beyond that described in the Proposed Action to 592 natural gas wells at 555 locations. This is in addition to 63 wells previously approved in the DFPA. Assuming a success rate of 65 percent, the Operators anticipate that 372 of the 385 new producing wells would be located within the RFO administrative area, with the remaining 13 wells located within the MVMA, RSFO administrative area. The levels of drilling activity provided in Alternative A were developed by BLM, in consultation with the DFPA Operators, and represent a potential increase in drilling activity that could be realized through further development of marginal properties within the DFPA.

Alternative A would be similar to the Proposed Action in that development would begin in 2003 (subsequent to the release of the ROD) within the DFPA and continue for approximately 20 years, with an LOP of 30-50 years. Various associated facilities (e.g., roads, pipelines, power lines, water wells, disposal wells, evaporation ponds, compressor stations, gas processing facility) would also be constructed throughout the DFPA.

The DFPA would have a maximum of: 2,220 acres of new surface disturbance from well locations (including on-site gathering, measurement, and dehydration facilities); 833 miles (4,035 acres) of new roads or upgrades of existing roads, 555 miles (1,166 acres) of new pipeline, and approximately 161 acres of new surface disturbance from ancillary facilities (i.e., 6 compressor stations [24 acres], 2 gas processing plant [60 acres], 4 water evaporation ponds [16 acres], 3 disposal wells [21 acres], and 16 water wells [40 acres]). Total new short-term surface disturbance resulting from Alternative A would be 7,582 acres (approximately 3.2 percent of the DFPA).

During the LOP (30-50 years), total disturbances would be reduced to 3,300 acres (516 acres associated with 361 well locations having 1.43 acres of remaining disturbance per well site, 2,623 acres of roads [this assumes a 65 percent drilling success rate with roads to unsuccessful wells being reclaimed] and 161 acres of surface disturbance associated with ancillary facilities), or approximately 1.4 percent of the DFPA.

The technical requirements for Alternative A are the same as described for the Proposed Action; however, more overall site disturbance requirements would be necessary for the additional well sites, access roads, pipelines, and ancillary facilities.

As with the Proposed Action, additional site-specific proposals and resource information would be contained in the individual well APD and/or ROW applications when submitted to the BLM. The BLM would prepare environmental assessments tiered to the EIS when necessary.

2.4 ALTERNATIVE B - NO ACTION

The regulations implementing Section 1502.14(d) of the NEPA require that the alternatives analysis in the EIS "include the alternative of no action" (43 CFR 1502.14 (d). For this project, the No Action Alternative is denial of the drilling and development proposal as submitted by the Operators. However, the Department of the Interior's authority to implement a "No Action" alternative which precludes drilling by denying the project is limited. An explanation of this limitation and the discretion the Department has in this regard is as follows:

An oil and gas lease grants the lessee the "exclusive right and privilege to drill for, mine, extract, remove and dispose of all oil and gas deposits" in the leased lands, subject to the terms and conditions incorporated in the lease (Form 3100-11). Because the Secretary of the Interior has the authority and responsibility to protect the environment within federal oil and gas leases, restrictions are imposed on the lease terms.

Leases within the DFPA contain various stipulations concerning surface disturbance, surface occupancy, and limited surface use. In addition, the lease stipulations provide that the Department of the Interior may impose "such reasonable conditions, not inconsistent with the purposes for which (the) lease is issued, as the (BLM) may require to protect the surface of the leased lands and the environment." None of the stipulations, however, would empower the Secretary of the Interior to deny all drilling activity because of environmental concerns.

Provisions in leases that expressly provide Secretarial authority to deny or restrict APD development in whole or in part would depend on an opinion provided by the U.S. Fish and Wildlife Service (FWS) regarding impacts to endangered or threatened species or habitats of plants or animals that are listed or proposed for listing. If the FWS concludes that the Proposed Action and its alternatives would likely jeopardize the continued existence of any endangered or threatened plant or animal species, then the APD(s) and Desolation Flats development may be denied in whole or in part.

Authorizations granted in previously approved projects located within the DFPA would remain in effect until an ROD is approved for the Desolation Flats project. These projects include the Mulligan Draw natural gas project (Mulligan Draw EIS and ROD, USDI-BLM 1992b), and the Dripping Rock Unit/Cedar Breaks oil and gas field development (Dripping Rock Unit/Cedar Breaks Oil and Gas Field Development EA and DR, USDI-BLM 1985).

Based on the above explanation, this alternative would deny the proposal as submitted but would allow consideration of individual APD's on federal lands on a case-by-case basis through individual project and site-specific environmental analyses. The No Action Alternative would allow drilling and development of 23 additional wells is the Mulligan Draw project area, and drilling and development of 34 additional wells in the Dripping Rock/Cedar Breaks project area (Table 1-5). Drilling outside

the Mulligan Draw and Dripping Rock/Cedar Breaks project areas, but within the DFPA could continue on a case-by-case basis until BLM made a determination that further drilling activities would result in field development. At that point, additional environmental analysis to determine the effects of field development would be necessary. In order to estimate future drilling activity under the No Action Alternative , it is assumed that wells drilled in the DFPA would be drilled at the same rate as the existing wells in the DFPA. As noted earlier, 63 wells have been drilled within the DFPA to date. Of the 63 wells drilled, 46 (73 percent) were drilled in the Mulligan Draw and Dripping Rock fields. Based on past drilling history, 23 additional wells could be drilled in the Mulligan Draw project area (2 of which could be drilled in the MVMA), and 34 additional wells could be drilled in the Dripping Rock/Cedar Breaks project area. Assuming that the operators would drill 57 wells in the Mulligan Draw and Dripping Rock fields (Table 1-5), the remaining 27 percent of the wells (21 wells) would be drilled in the DFPA outside the Mulligan Draw and Dripping Rock fields. Total wells drilled under the No Action Alternative is estimated at 78. The technical requirements for Alternative B - No Action are the same as described for the Proposed Action (Section 2.5 - Plan of Operations). Additional infrastructure necessary to support existing wells within the DFPA and future wells drilled under the No Action Alternative would be considered on a case-by-case basis. Additional gas development could occur on State and private lands within the project area under APD's approved by the WOGCC.

Road and pipeline construction disturbances per well site associated with Alternative B would be similar to the Proposed Action. The No Action Alternative would have approximately 1,043 acres of total new short-term surface disturbance (13.37 acres per well) from well locations, new roads or upgrades of existing roads, and new pipelines. It is anticipated that the existing natural gas production infrastructure within the DFPA (e.g., compressors, water disposal wells, etc.) would support the No Action Alternative during the 30 - 50 year LOP.

Total disturbances would be reduced to 441 acres following reclamation of the pipelines and portions of the well pads not needed for production operations.

As with the Proposed Action, additional site-specific proposals and resource information would be contained in the individual well APD and/or ROW applications when submitted to the BLM. The BLM would prepare environmental assessments tiered to the EIS when necessary.

2.5 PLAN OF OPERATIONS

2.5.1 Preconstruction Planning and Site Layout

Development activities proposed on *fee and State of Wyoming surface lands* would be approved by the WOGCC. The WOGCC permitting procedures require filing an APD with the WOGCC and obtaining a ROW from the surface owner.

The Operators would follow the procedures outlined below to gain approval for wells and ancillary facilities on *public lands* within the project area. These procedures would apply to all alternatives.

- Prior to the start of construction activities, the applicant would submit a Notice of Staking (NOS), APD, or ROW Application to the BLM with a map showing the specific location of the proposed activity (e.g., individual drill sites, pipeline corridors, access roads, or other facilities). The application would include site-specific plans where necessary to describe the proposed development (i.e., drilling plans with casing/cementing program, surface use

plans with road and drill pad construction details, and site specific reclamation plans, etc.). Approval of all planned operations would be obtained in accordance with authority prescribed in Onshore Oil and Gas Order No. 1 (Approval of Operations on Onshore Federal and Indian Oil and Gas Leases).

- The proposed facility would be staked by the applicant and inspected by an IDT and/or an official from the BLM to ensure consistency with the approved Great Divide Resource Management Plan, the Green River Resource Management Plan, approved mitigation measures incorporated into the DFPA ROD, and plans provided by the applicant in the APD or ROW Application.

- More detailed construction plans, when required by the BLM for the proposed development, would be submitted to the BLM by the applicant. The plans would address concerns that may exist concerning construction standards, required mitigation, etc. Negotiation of these plans between the applicant and the BLM, if necessary to resolve differences, would be based on field inspection findings and would take place either during or after the BLM on-site inspection.

- The applicant and/or its contractors would revise the APD or ROW Application as necessary per negotiations with the BLM. The BLM would complete a project-specific EA that incorporates agreed upon construction and mitigation standards. The BLM would then approve the specific proposal and attach the Conditions of Approval to the permit. The applicant must then commence with the proposed activity within one year.

Following is a general discussion of construction techniques proposed to be used by the Operators on public lands. These construction techniques would be applicable to drill site, pipeline, and access road proposals within the project area and may vary between the individual Operators.

2.5.2 Construction and Drilling Phase

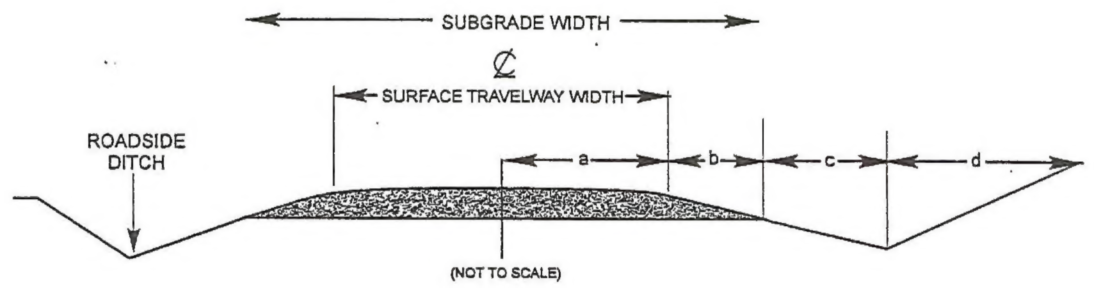
2.5.2.1 Access Road Construction

Access to the DFPA is provided by the two-lane paved WYO 789 from I-80 at Creston Junction south to the intersection with Carbon County Road 608 ("Wamsutter/Dad Road") (Figure 1-2). Access is also provided south from Wamsutter on Carbon County Road 608. Access to the interior of the project area is provided by an existing road network developed to service prior and ongoing drilling and production activities. The road network within the project area is discussed in more detail in Chapter 3, Affected Environment.

BLM Manual Section 9113 road classifications categorize DFPA roads into three separate classes:

1) <u>Collector Roads</u>. These roads normally provide primary access to large blocks of land and connect with or are extensions of a public road system such as WYO 789. Collector roads are two-lane and require application of the highest road standards. The predominant design speed is 30 to 50 mph depending on terrain and/or as determined by BLM, and the subgrade width is a minimum of 28 feet (24 feet full-surfaced travelway). A typical roadway cross-section with width specifications is shown in Figure 2-1.

2) <u>Local Roads</u>. These are low volume roads providing the internal access network within an oil/gas field such as Carbon County Road 608 . The design speed is 20-50 mph depending



	Minimum Subgrade Width (ft.)	Minimum Surfaced Travelway Width (ft)	a (ft)	b (ft)	c (ft)	d (ft)	Approximate Disturbance Width (ft)	Total ROW Width (ft)	Design Speed (mph)
Resource Road	16	14	7	2	4	8	40	50	15-30
Local Road	24	20	10	2	4	8	48	55	20-50
Collector Road	28	24	12	2	4	8	52	60	30-50

DIAGRAM OF TYPICAL TURNOUTS ON RESOURCE ROADS (PLAN VIEW)

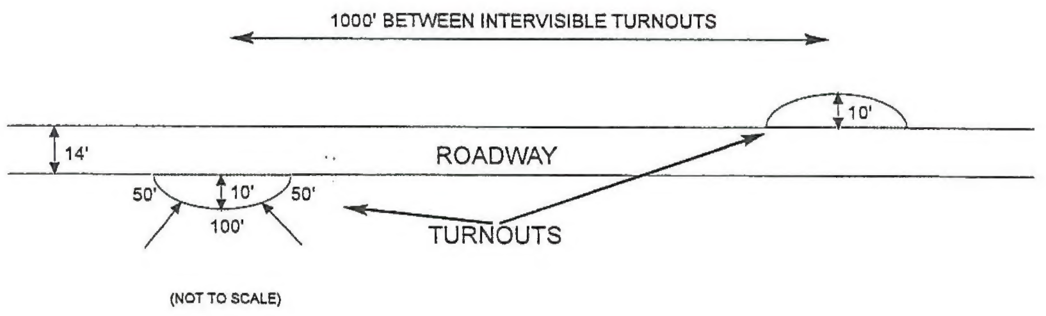


Figure 2-1. Typical Roadway Cross-Section with Width Specifications.

on terrain, and the subgrade width is normally 24 feet (20 feet full-surfaced travelway). Low volume roads in mountainous terrain may be single-lane roads with turnouts.

3) Resource Roads. These are normally spur roads that provide point access. Roads servicing individual oil/gas exploration and production locations fall within this classification. The road has a design speed of 15-30 mph and is constructed to a minimum subgrade of 16 feet (14 feet minimum full-surfaced travelway) with intervisible turnouts.

All new access roads within the DFPA would be constructed for the specific purpose of natural gas field development. Roads would be located to minimize disturbances and maximize transportation efficiency. The operators propose to construct access roads across public lands to wells in accordance with BLM Manual 9113 standards. New access roads would be designed and constructed to resource road standards to facilitate reclamation should the well be a dry hole. Roads located on private lands would be constructed in accordance with standards imposed by the private land owner. The number of roads would be limited to decrease potential impacts by discouraging development of looped roads and by accessing wells from short resource roads off the local roads. Roads would be closed and reclaimed by the operators when they are no longer required for production operations, unless otherwise directed by the BLM or private landowners. Roads would be designed to minimize disturbance and would be built and maintained as specified by the BLM to provide safe operating conditions at all times. Surface disturbance would be contained within the road ROW.

The Operators estimate that each proposed new well would require an average of 1.5 miles of new or upgraded road construction (approximately 542 miles) and 1.0 mile of pipeline. Of this, approximately one-half the pipeline length would be constructed in the roadway. Initial combined access road and pipeline disturbance would be approximately 50 feet in width (0.6 acre per well location for pipeline and 2.42 acres per well location for road). The remaining 0.5 mile of pipeline construction cross-country would occur with a construction width of 25 feet (1.5 acres per well location). Access road construction disturbance width without pipeline would be 40 feet (4.85 acres per well location). Construction of proposed new roads and pipelines is estimated at 3,382 acres (9.37 acres per well x 361 well locations).

Construction equipment and techniques utilized by the operators would be standard (e.g., crown-and-ditch method). The soils in the area would be considered and if necessary, the surface would be graveled before the rig and/or other drilling equipment is moved on to the location (well pad). Should soft spots develop on the roadway during construction or drilling operations, they would be immediately covered with weed-free crushed rock or gravel. Where identified during on-site review by the BLM, problem areas on access roads to producing well sites would be graveled to a depth of 4 to 6 inches to reduce erosion and sedimentation. Surfacing and base course materials would be obtained from existing, operational gravel pits located on fee or federal sources near the project area. Respreading of topsoil and windrowed vegetation to the sideslopes of the newly constructed access roads and revegetation would begin the first appropriate season following the well going on production. Reclamation measures would be implemented the first operating season after well abandonment. The access road to an unproductive well site would be reclaimed upon abandonment of the well using stockpiled topsoil and a seed mixture contained in the approved APD/ROW.

In the event drilling is non-productive, all disturbed areas, including the well site and new access road, would be reclaimed to the approximate landform that existed prior to construction. Reclamation and site stabilization techniques would be applied as specified in the APD Surface

Use Plan or the ROW Plan of Development (POD). If drilling is productive, all access roads to the well site would remain in place for well servicing activities (i.e., maintenance, improvements, etc.). Partial reclamation would be completed on segments of the well pad and access road ROW no longer required.

Estimated traffic requirements for drilling operations, completion operations, and production operations are shown in Table 2-2. This information is based on the estimated traffic impact of well field activities associated with drilling approximately 19 wells annually (385 wells over a 20-year drilling period). The Trip Frequency column indicates the estimated number of round trips to the project area for each activity. The figures provided in Table 2-2 should be considered general estimates. Activity levels vary over time in response to natural gas prices, weather, corporate decisions and other factors.

Table 2-2. Estimated Traffic Associated with Proposed Action-Related Well Field Development and Operations Activities.

Type of Traffic	Trip Frequency
Pre-Approval & Permitting	
Company Personnel	variable
Permitting Contractor	variable
Surveyors	1/well
Resource specialists	variable
Access Roads/Well Pad Construction	
Dozer haul truck	1/well
Grader haul truck	1/well
Backhoe haul truck	1/well
Gravel truck	(Dependent on need and source)
Drilling	
Rig supervisor	1/well/week
Rig crews	2/well/day (12 hour shift)
Rig move & setup	35/well
Drilling Engineer	8/well
Mud logger	1/well/week
Mud engineer	1/well/week
Mud trucks	1/well/week
Well loggers	2/well/week
Fuel trucks	1/well/day
Rig mechanics	1/well/week
Drill bit/tool deliveries	2/well/week

Table 2-2 continued

Completion	
Completion crew	2/well/day
Completion rig equipment truck	4/well
Casing crews	4/well
Casing haulers	6/well
Cementing crews	4/well
Cement trucks	6/well
Cement pumper truck	2/well
Welders	4/well
Equipment/repair trucks	As needed
Fracing crews	2/well/day
Fracing trucks	12/well
Supply trucks	4/well/week
Field Development	
Gathering systems construction crews	2/day for 4 days
Trencher haul truck	1/well
Pipe delivery	6/well
Surveyor	1/well
Welder	1/day for 4 days
Reclamation	variable
Compressor station construction crews	7/day for 7 days
Processing plant construction crews	14/day for 21 days
Production	
Production foreman	2/week
Pumper	1/day
Oil Hauler	2/month
Workover/Service/Maintenance	Variable
Reclamation	
Dozer haul truck	2/well
Grader haul truck	2/well
Seeder haul truck	2/well
Crew truck	7/well

2.5.2.2 Well Pad Design and Construction

The traditional single-well pad design has been utilized in the DFPA in the past and would continue to be the predominant drill site design utilized under the Proposed Action. The traditional well pad would be constructed from native materials located at the site. Drilling activity under the Proposed Action is planned in the Lance, Fox Hills, Lewis, and Almond formations. The well pad size for drilling in all formations is the same and is estimated to be 370 ft. x 400 ft (Figure 2-2). Under the Proposed Action, 361 well locations are planned to be drilled during the planned 20-year drilling and development period, with an approximate drilling success rate of 65 percent (250 producing wells at 235 well locations). The actual well pad size would depend on terrain limitations existing at the site. The well pad would be designed so that construction materials balance (i.e., soil materials taken from cuts would be about the same quantity as that needed for fill to construct a level pad), while attempting to minimize the total disturbed area. After completion of drilling, the productive well pad size would be reclaimed to 250 feet x 250 feet.

Projected disturbance for proposed new well sites, using the average pad size (370 feet by 400 feet) would be 4.0 acres per well. This figure assumes approximately 0.6 acre of disturbance associated with cut/fill areas created during construction. Total disturbance associated with 361 well locations would be 1,444 acres (4.0 acres per well x 361 well locations). Following partial reclamation of the productive well sites and full reclamation of all unproductive well sites, the remaining site disturbance would be 336 acres (1.43 acres per well x 235 well locations).

All available topsoil suitable for reclamation (up to 12 inches) would be stripped from the well pad area and stored adjacent to the well pad. This storage site is to be designated on the well pad design plan in the APD prior to start of actual well pad construction. Cut and fill slopes would be designed, if deemed necessary, in a manner that would hold topsoil during reclamation and subsequent re-establishment of vegetation. Well pad construction and related facilities would usually require approximately 4 to 6 days to complete, depending on site and terrain limitations. After topsoil stripping operations are complete, construction of the well pad would begin. Construction practices would involve use of standard earthmoving equipment. Components of the well pad include construction of a reserve pit to temporarily store drilling fluids, cuttings, and water produced during drilling, and a flare pit for emergency and development flaring (Figure 2-2).

In non-critical areas, and when a fresh water based mud system is being used, the Operators propose to use an unlined earthen reserve pit. Earthen reserve pits would be used only after evaluation of the pit location for distance to surface waters, depth to useable ground water, soil type and permeability, and after evaluation of the fluids which would likely be retained in the pit. If deemed necessary during the individual well site APD review, the reserve pit would be lined with an impermeable liner to prevent seepage. Bentonite or impermeable lining would be used where appropriate as defined during APD review. The synthetic liner would be at least 12 mils (12,000ths of an inch) thick, reinforced with a bursting strength of 174 x 175 pounds per inch (ASTMD 75719), resistant to decay from sunlight and hydrocarbons and compatible with the drilling fluids to be retained.

All reserve pits would be fenced with sheep tight wire on 3 sides immediately following construction. The fencing would remain in place as long as drilling operations are ongoing. The fourth side of the reserve pit would be fenced at the time the rig substructure is moved from the drill site location to minimize the potential for loss of wildlife and domestic animals.

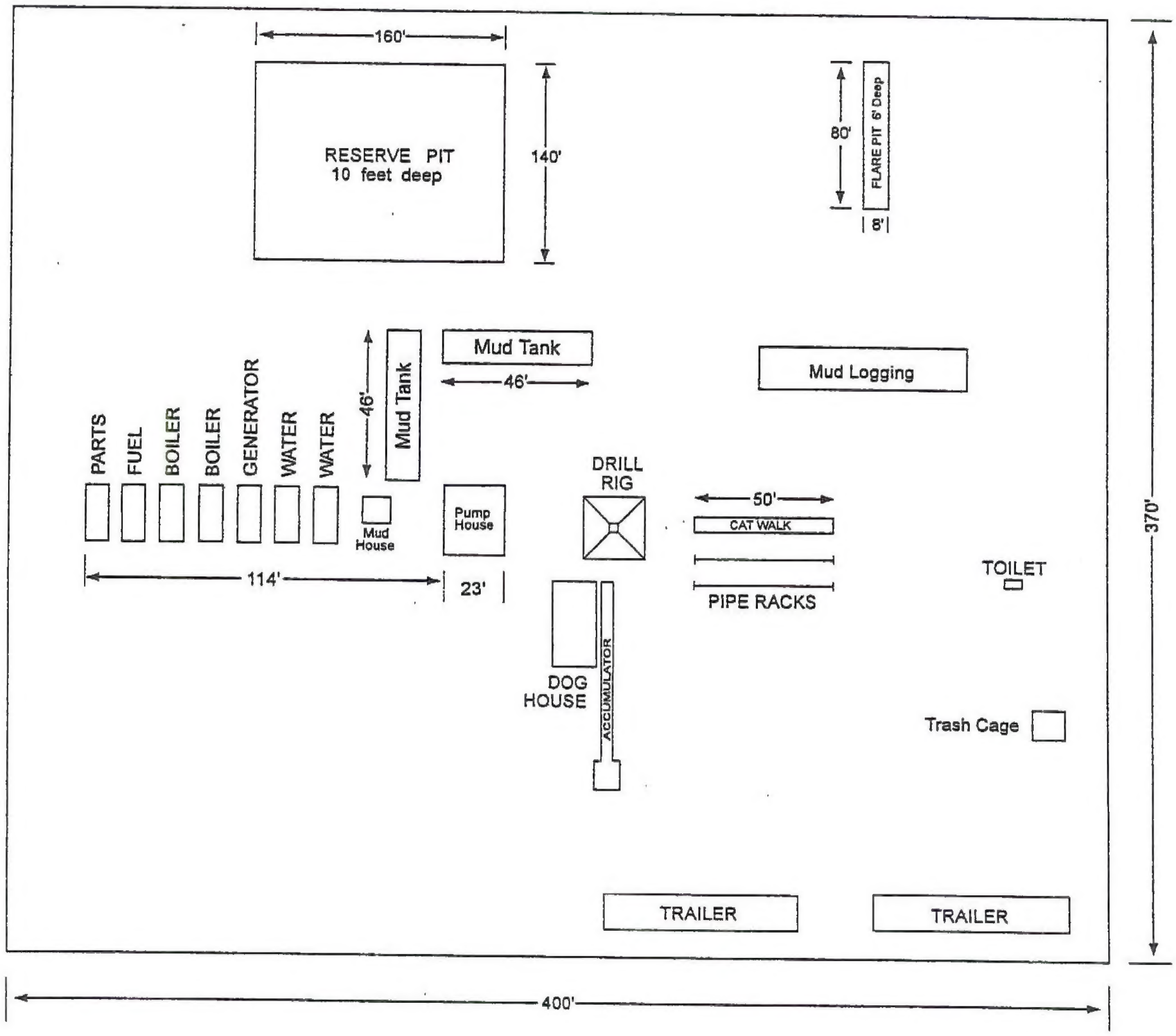


Figure 2-2. Typical Well Pad Layout During Drilling Operations - Lewis/Lance/Almond/ Fox Hills Formations.

Any hydrocarbons floating on the surface of the reserve pit would be removed as soon as possible after drilling operations are complete. Reserve pit fluids would be allowed to dry by evaporation for approximately one year prior to reserve pit closure and drill site reclamation. BLM regulations allow placement of production water in reserve pits for periods up to 90 days. When the pit is backfilled, cuttings and drilling muds would be covered to a depth of at least three feet. If drilling or production fluids remain in the pit after one year, alternate methods of drying, removal of the fluids, or other treatment measures would be determined by the operators in consultation with the BLM. Necessary permits would be acquired by the operators if fluids are transported off-site for disposal. Reserve pits containing hydrocarbons and/or other potentially hazardous materials would be netted and/or flagged, as deemed appropriate by the BLM.

Service trailers located on the well pad would be self-contained and would not require a septic system. Sewage would be hauled off-site to a State Department of Environmental Quality (DEQ) approved disposal site, or treated on-site, as directed by the BLM.

Hazardous materials associated with well drilling and production are listed in the Hazardous Materials Management Plan located in Appendix D, along with a general description of hazardous materials management policies and procedures.

If a well is productive, site erosion and off-site sedimentation would be controlled by promptly revegetating sites in the first appropriate season (fall or spring) after drilling, and providing surface water drainage controls, such as berms, sediment collection traps, diversion ditches and erosion stops as required. These measures would be described in the individual APD/ROW.

Some surface locations within the DFPA may not be feasible to occupy, either for economical (e.g., high road construction costs), physical (e.g., steep terrain), or other environmental reasons (e.g., sage-grouse lek). A drilling method the Operators may use to access bottom-hole locations in these areas is directional drilling from a single-well pad (multi-well, directional drilling).

The multi-well single pad design provides for construction of one well pad with as few as two or as many as eight wells drilled from a central location. A typical drawing of a multi-well pad is shown on Figure 2-3. The first well is usually drilled as a vertical well and the remaining wells are drilled directionally. This design and setup provides economic and environmental advantages associated with one access route for multiple wells along with common gathering, separation, storage, and transportation facilities. Also, with multi-well drilling, several wells can be serviced at one time with one trip, thus minimizing vehicular traffic, dust control, and disturbance to wildlife. Use of multi-well directional drilling techniques would be contingent on economic considerations such as the cost to develop leases having marginal profitability.

Techniques and equipment for constructing a multi-well directional drill pad would be similar to those utilized in constructing a single-well traditional well pad. Directional drilling requires special drilling tools and procedures to change the direction of the well bore from vertical to directional and possibly horizontal in order to penetrate targets that cannot be reached by conventional vertical drilling methods. Advancement in directional drilling technology makes it possible to reach bottom holes 2,000 or more feet from the rig. Certain geologic features can limit this (e.g., faults, structural dips, etc.). A typical directional drilling schematic showing directional drilling profile well path, target, and limits is shown in Figure 2-4.

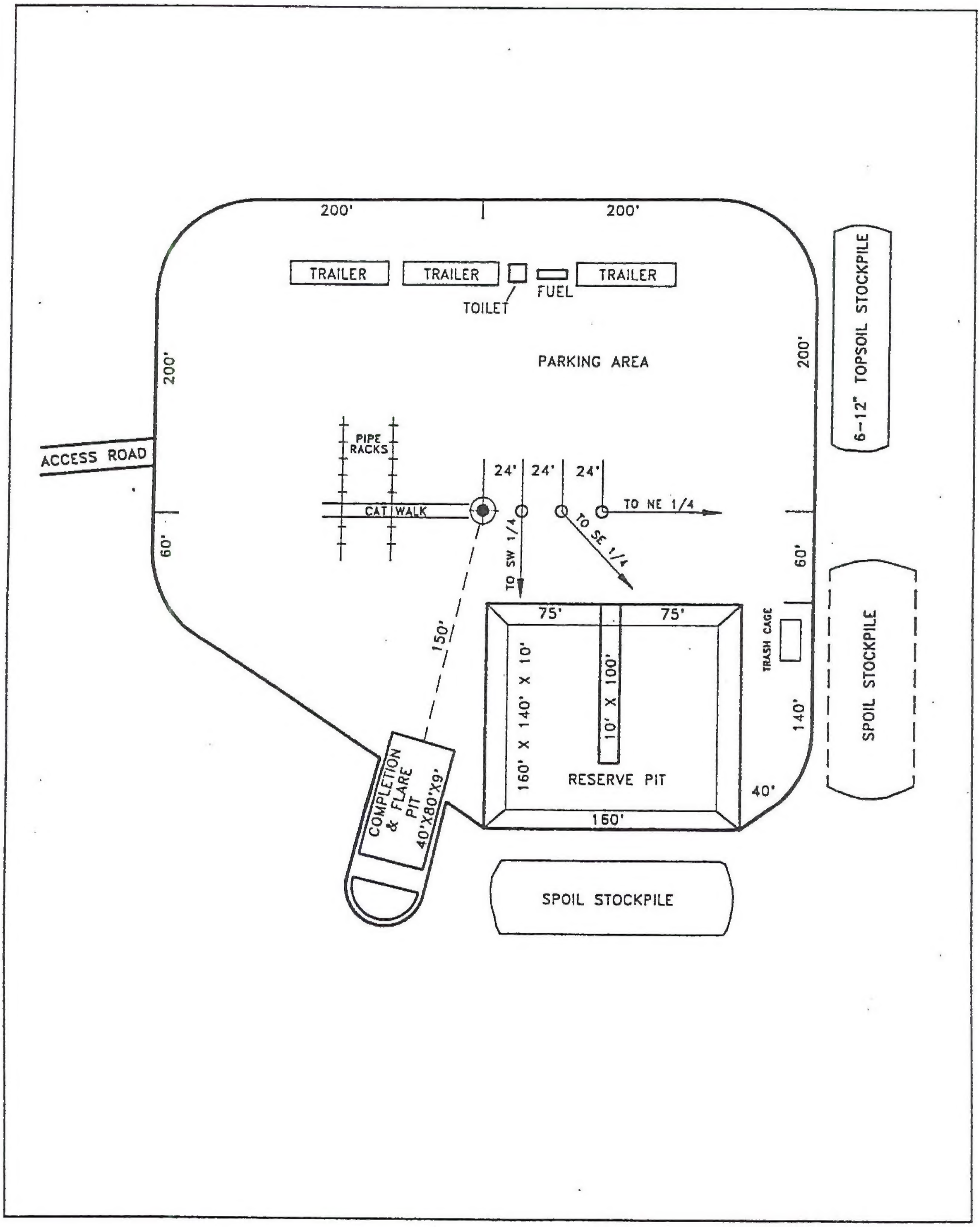


Figure 2-3. Typical Drawing of a Multi-well Pad Showing Location and Spacing of Multiple Wells.

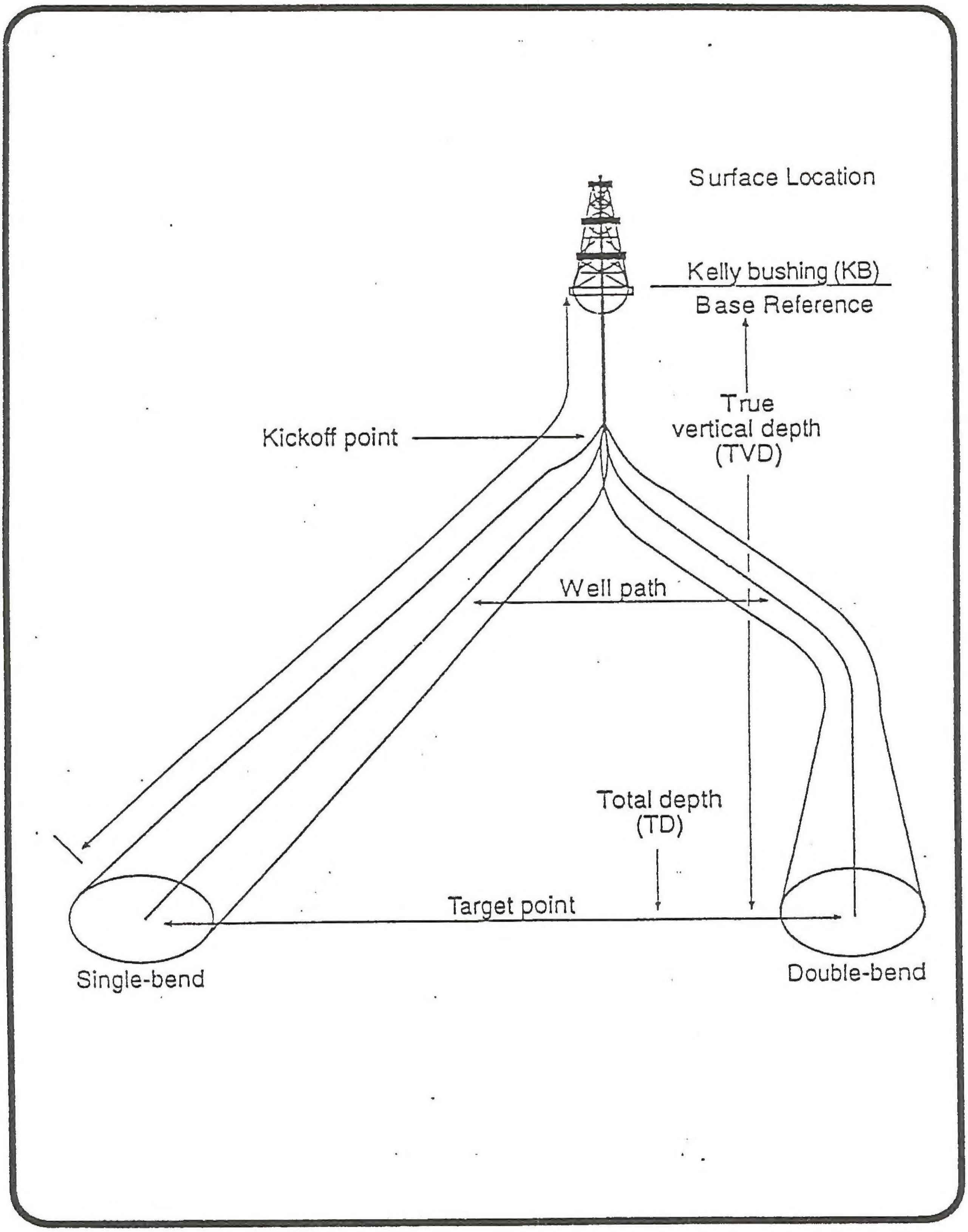


Figure 2-4. Directional Drilling Profile Well Path, Target, and Limits.

Another drilling procedure that may possibly be utilized in the DFPA is horizontal drilling. This drilling technique has been successfully utilized in other gas development programs in Wyoming to improve the productivity of existing marginal wells, and may have application in the DFPA in developed fields exhibiting marginal profitability.

Horizontal drilling involves drilling a curved section from the bottom of a vertical hole, followed by drilling horizontally into the productive formation. Long, horizontally drilled sections may increase oil and gas flows. Figure 2-5 shows a cross-sectional view of horizontal drilling. A schematic showing drilling and completion phases of a horizontal well is shown in Figure 2-6.

2.5.2.3 Drilling Operations

Each drilling operation would require transport of approximately 35 truckloads of drilling-related equipment and materials to facilitate the drilling operation. This number includes transportation of the drill rig, drill pipe, drilling fluid products, and related support equipment, but does not include the truck traffic required for resupplying the operation (e.g., fuel, drilling fluid additives, etc.). Additional traffic would be variable, depending on the phases of the drilling operation, but should average eight or nine vehicles per day per drill site throughout the drilling operation, with substantially higher peaks during rig set-up and relocation and during certain completion activities.

Total rig-up activities and installation of ancillary facilities would take approximately 3 days to complete.

Drilling operations would be spread over the 20-year life of field development, with approximately 15 to 20 wells drilled each year. The number of wells drilled annually would depend on such factors as market prices, permit approval, and rig availability. Completion operations for each productive well would commence as soon as possible after the drilling rig moves off location.

The geologic formations to be tested in the project area are the Lance, Lewis, Almond, and Fox Hills Formations. The drilling depth varies from 9,800 feet to 11,000 feet for a gas well drilled into the Lance Formation, requiring approximately 20 to 30 days to drill vertically, barring any major drilling problems. The approximate drilling depth for a Fox Hills Formation test is 12,000 to 13,000 feet and would take approximately 30 to 40 days to drill vertically. The approximate drilling depth for a Lewis Formation test is 12,500 to 13,500 feet and would take approximately 30 to 40 days to drill vertically. Almond Formation test wells would be drilled from 14,000 to 14,500 feet and require from 40 days to 60 days to drill. Completion operations range from a minimum of 30 days for shallow wells, and more than 60 days for deep wells.

Water, for drilling and service trailer use, would be obtained from State of Wyoming approved locations or local water source wells. Water requirements for drilling average approximately 11,000 barrels (bbls) per well (462,000 gallons). The operators intend to use freshwater-based mud for the majority of their drilling operations.

Methods used for the disposal of produced water (water produced in association with the oil and gas which is separated out at the well location) would vary with each operator but would generally be accomplished by either: (1) disposal in an underground injection well, (2) surface discharge, (3) surface evaporation in lined or unlined ponds, or (4) hauling to an approved disposal facility. Each operator would obtain the permit(s) necessary for the selected disposal method. Depending on timing of availability, quantity, and quality of produced water, some of the produced water could be used in well drilling and completion, and pipeline construction and hydrostatic testing.

2.5.2.4 Pipeline Construction

There are three natural gas pipeline transmission systems currently in operation in the DFPA. Questar Pipeline Company operates approximately 21 miles of 10 inch pipeline and 7 miles of 8 inch pipeline in the project area. CIG operates approximately 16 miles of 20 inch pipeline and 35 miles of 6 inch pipeline within the DFPA. Coastal Field Services operates 11 miles of 6 inch pipeline within the DFPA. New gas gathering lines would be constructed to facilitate transportation of natural gas and would be connected to these pipeline transmission systems by the DFPA Operators. New gathering lines would range in size from 2 to 6 inches in diameter, depending on the production rate at each well.

The actual pipeline location would be surveyed and staked prior to start of any construction activities. Where possible, new pipelines would be located adjacent to access roads. The company installing the pipeline would submit detailed design plans when required by the BLM for pipeline(s) planned on slopes 25 percent or greater. In order to minimize the total amount of surface disturbance, the pipeline corridor may or may not be cleared of heavy brush prior to any activities. This determination would be made by the BLM prior to construction and would consider factors such as construction crew safety concerns, sideslopes, and brush density.

Stripping of topsoil from the pipeline corridor would not be performed. Pipeline construction would occur in a planned sequence of operations common to natural gas pipeline installation specifications and would take place along a corridor of continuous activity. All pipeline installation work would be completed by a contractor working under the supervision of the pipeline company. Cross-country construction activities would be confined to a 25-foot ROW.

The pipeline trench would be excavated mechanically with trenching equipment such as a backhoe or trencher. The width of the trench would be approximately 18 - 24 inches. The trench would be constructed to a minimum depth to maintain 36 inches of normal soil cover and 24 inches of cover in consolidated rock.

Pipe laying activities would include pipe stringing, bending, welding, coating, lowering of pipeline sections, and backfilling. The newly-constructed pipelines would be tested to prove structural soundness using either inert gas or hydrostatically tested with water. Integrity tests would be conducted in full compliance with the mandatory BLM ROW stipulations. Gas-testing procedures are summarized as follows: Certified pipeline welders are utilized during pipeline construction to assure high quality work. Ten percent of the pipeline is randomly x-rayed after welding to check the quality of the welds. All fittings on the pipeline are also x-rayed. The pipeline is slowly pressured-up with produced gas to the maximum operating pressure of the pipeline being tied into. This pressure is maintained for 24 hours, then the natural gas is released to sales. If a leak is discovered, the pipeline is purged to the atmosphere, the pipeline repaired, and the pressure tested again by the same procedures. Policies and plans for spill prevention, reporting and response are discussed in the Hazardous Materials Management Plan (Appendix D).

Necessary water appropriation permits would be obtained from the Wyoming State Engineer's Office. Water would be taken from local water sources near the DFPA. After testing operations are completed, the water would be pumped into water hauling trucks and transported to drilling locations within the project area to be used in conjunction with the drilling operations. If not required for drilling operations, the test water would be disposed of onto undisturbed land having vegetative cover or into an established drainage channel in a manner as not to cause accelerated erosion. Prior to discharge of hydrostatic testing water from the pipeline, the pipeline operator

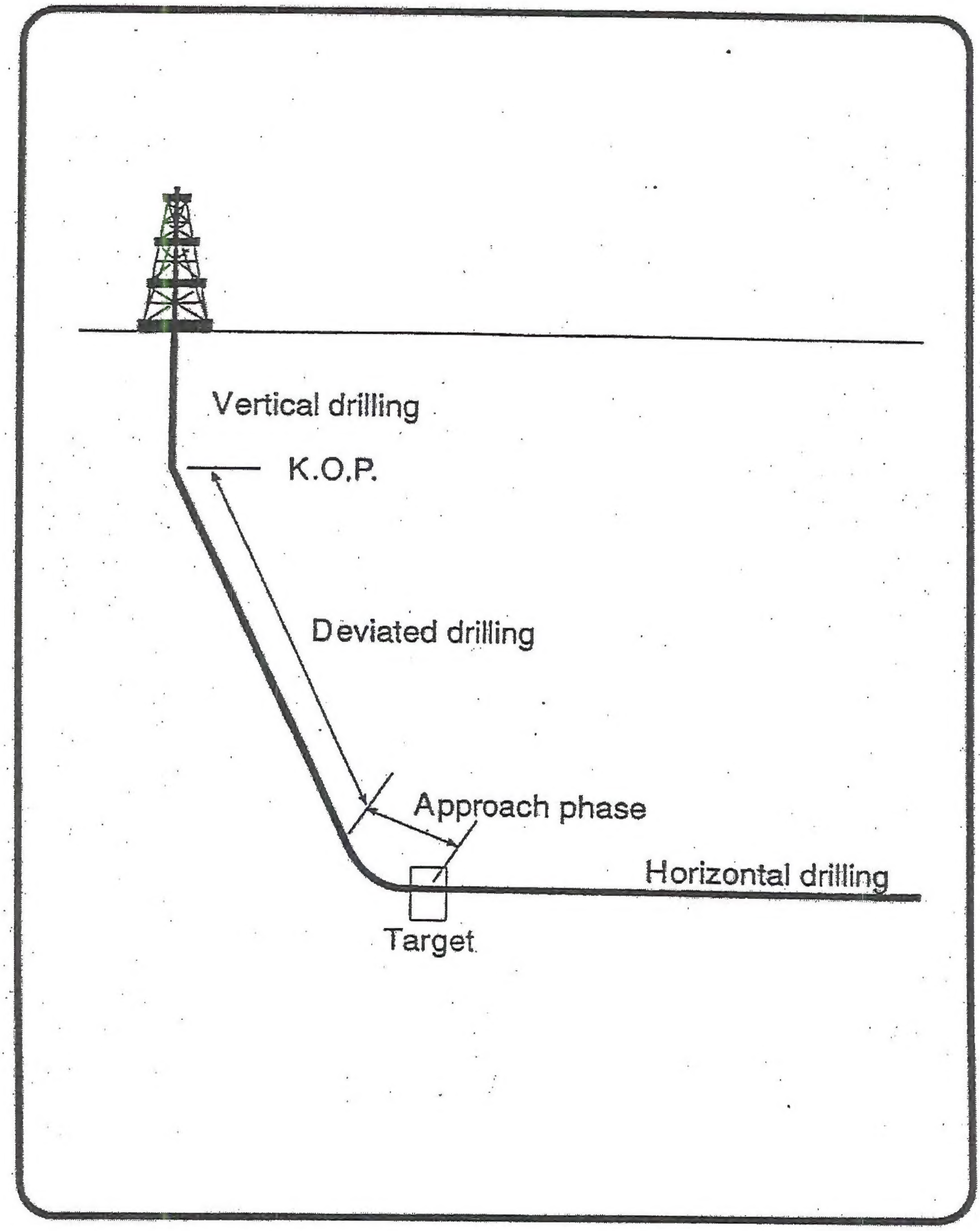


Figure 2-5. Cross-sectional View of Horizontal Drilling.

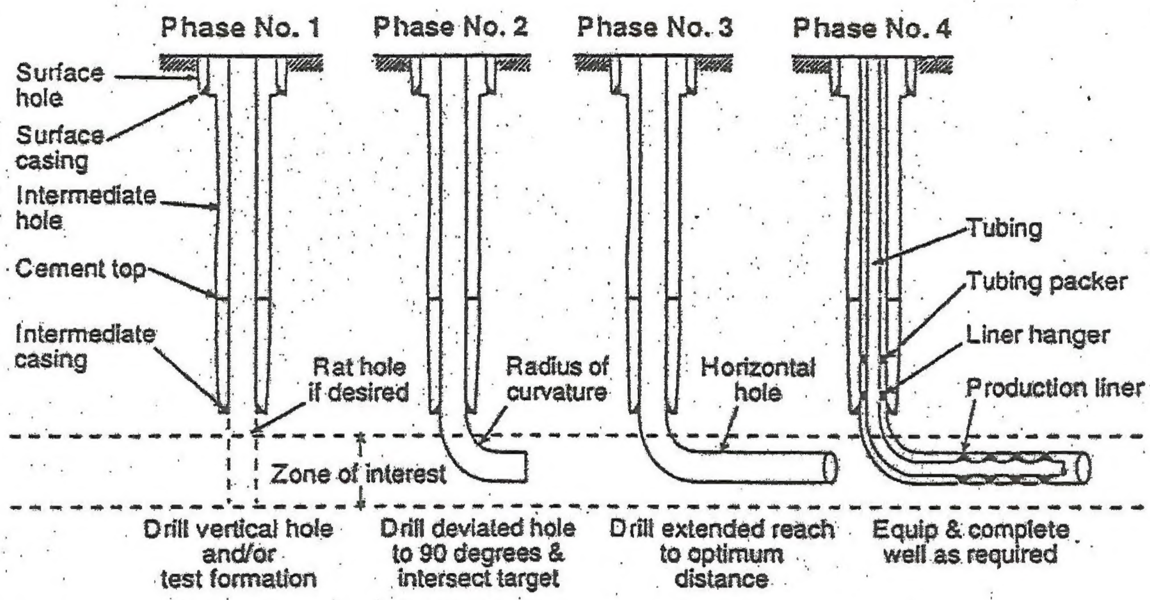


Figure 2-6. Schematic Showing Drilling and Completion Phases of a Horizontal Well.

would design and install a suitable energy dissipater at the outlets, and design and install suitable channel protection structures necessary to ensure that there would be no erosion or scouring of natural channels within the affected watershed as a result of such discharge.

Water produced in association with natural gas or oil production could also be used to hydrostatically test new pipeline. Produced water used for testing would subsequently be disposed of in a manner approved by the BLM in the POD or ROW application.

Subsoil would be backfilled and compacted into the trench over the pipe. Site regrading would occur where necessary. Reclamation of the pipeline route would occur as authorized by the BLM ROW Grant.

Approximately 361 miles of new pipeline would be constructed within the DFPA under the Proposed Action. The Operators estimate that about 1.0 mile of pipeline would be constructed for each well drilled, with about 0.5 mile of pipeline constructed along the access road and about 0.5 mile constructed cross country. The total disturbance width for pipelines constructed along roads would extend 50 feet (roads = 40 feet and pipelines = 10 feet). Cross country construction would require a 25 foot disturbance width.

As discussed in Section 2.5.2.1, Access Road Construction, the Operators estimate that each proposed new well would require an average of 1.5 miles of new or upgraded road construction, (approximately 542 miles), and 1.0 mile of pipeline (approximately 361 miles). Of this, approximately one-half the pipeline length, or 0.50 mile, would be constructed along the roadway. Initial combined access road and cross-country pipeline disturbance would be approximately 50 feet in width. Construction of proposed new roads (1.0 mile x 40 feet per well site) and roads and pipelines combined (0.5 mile x 50 feet per well site) is estimated at 2,841 acres of new site disturbance (7.87 acres of disturbance per well x 361 well locations). Cross country pipeline construction (0.5 mile in length) with a 25-foot disturbance width would create approximately 542 acres of new site disturbance (1.5 acres of disturbance per well x 361 wells).

The ROW would be placed adjacent to existing pipelines or roads where possible. A typical schematic of pipeline installation procedures is shown in Figure 2-7. Figure 2-8 shows a typical roadway cross-section with pipeline installation alongside the road.

2.5.2.5 Natural Gas Production

2.5.2.5.1 Completion and Testing Operations

All access roads to productive well sites would be maintained for well servicing activities (i.e., maintenance, improvements, etc.) if drilling is productive. Reclamation would be completed on segments of the well pad and access road ROW no longer required.

Well completion operations involve the placement and cementing of well casing and perforation, stimulation and testing of potentially productive zones. Well casing involves running steel casing pipe into the open borehole and cementing the pipe in place. Perforation, stimulation, and testing requires large equipment to be transported and utilized at the well site, and flaring of produced gas. A typical cased well bore would consist of conductor pipe, surface casing, and production casing. Well completion operations involve the placement and cementing of well casing.

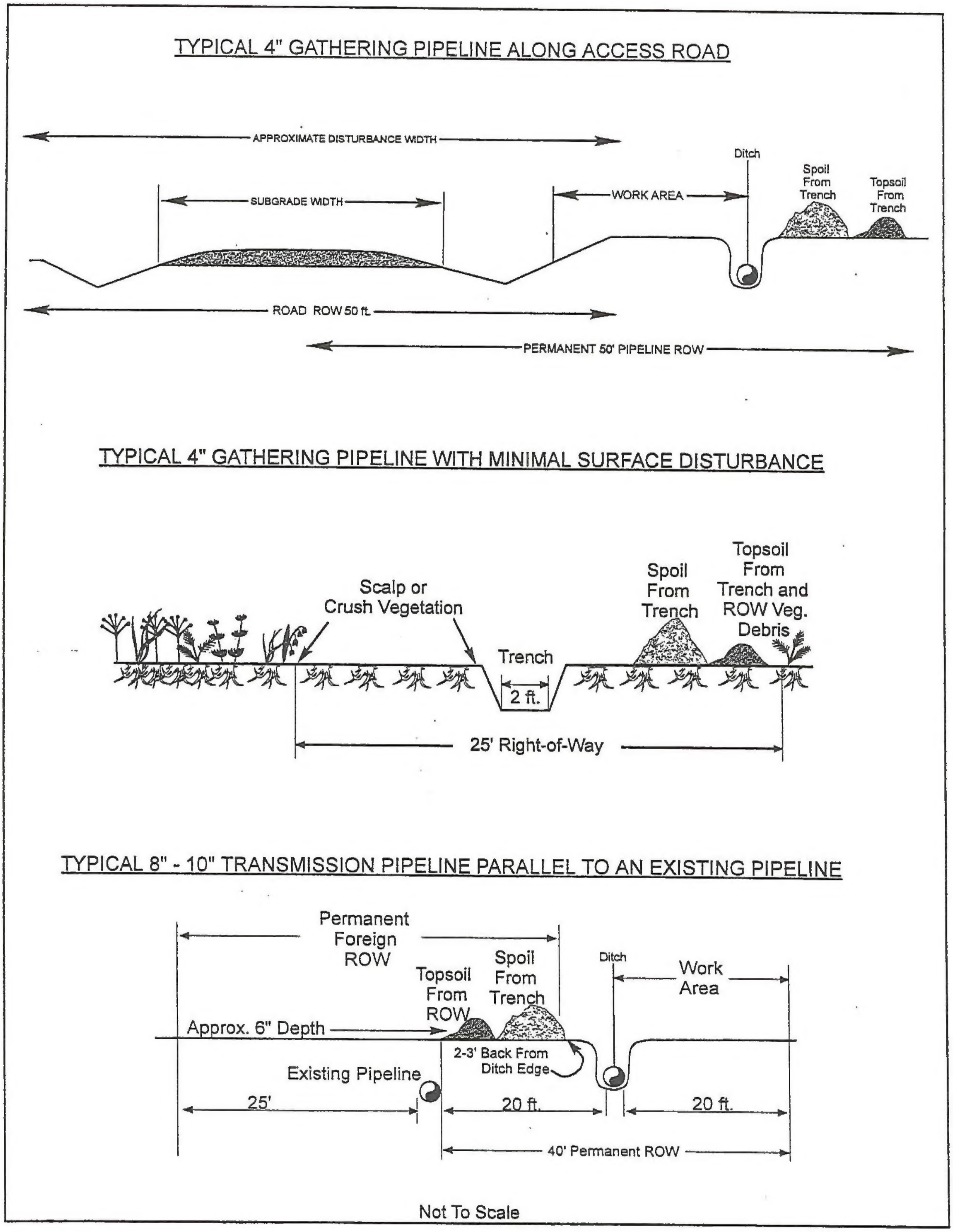
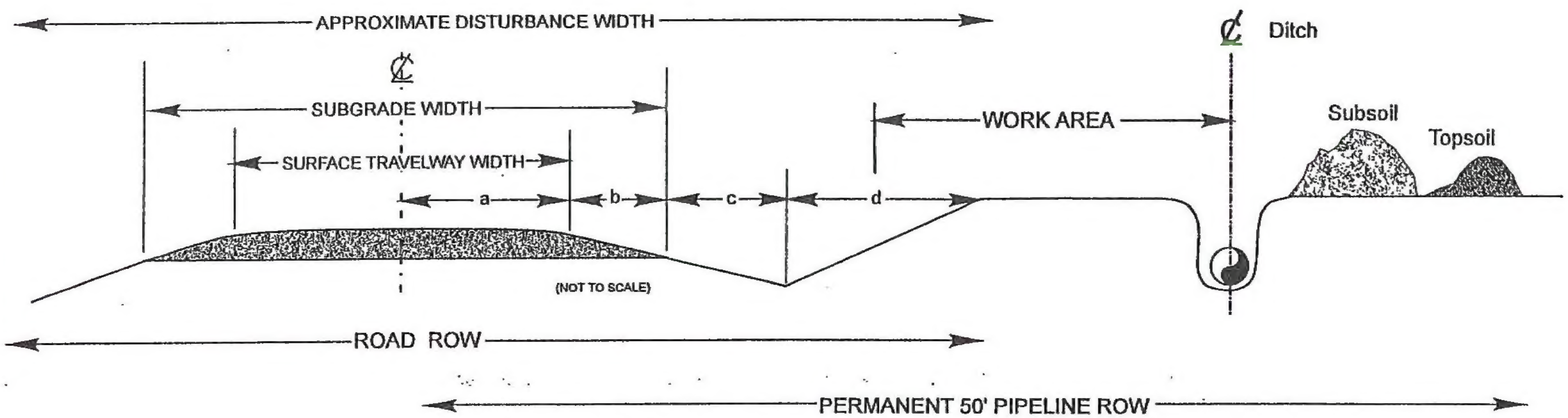


Figure 2-7. Typical schematic of Pipeline Installation.



	Minimum Subgrade Width (ft.)	Minimum Surfaced Travelway Width (ft)	a (ft)	b (ft)	c (ft)	d (ft)	Approximate Disturbance Width (ft)	Total ROW Width (ft)	Design Speed (mph)
Resource Road	16	14	7	2	4	8	40	50	15-30
Local Road	24	20	10	2	4	8	48	55	20-50
Collector Road	28	24	12	2	4	8	52	60	30-50

Figure 2-8. Typical Roadway Cross-section with Pipeline Installation Alongside the Road.

Surface casing would be set at the start of drilling operations to prevent gas, oil, condensate, or water from migrating from formation to formation, to isolate producing zones, to isolate and protect surface formations and to attach pressure control equipment. Setting and cementing of production casing provides separation and isolation from abnormally pressured zones, usable water zones, and other mineral deposits. The well casing would be perforated in the productive interval to allow the flow of hydrocarbons to the surface. Approximately 10,000 barrels of water may be required in the completing and testing operations per well. Most completions use a string of tubing that is inserted in the casing to the top of the perforated productive zone to allow gas, condensate, and water to flow to the surface where it is collected, measured, and contained. Completion operations typically last up to 60 days for deep tests.

2.5.2.5.2 Production Operations

Production operations would occur on a year-round basis, occasionally limited by weather, maintenance, workover operations, and ground and site conditions. Production operations would require use and maintenance of access roads within the project area on a year-round basis. Construction of power lines to well sites is not anticipated. Current production operations in the DFPA do not require electrical power for compressors and other production facilities.

Typical gravel road maintenance would occur during the summer and early fall months. Winter maintenance would include blading of snow from the access road as necessary, with the blade kept above the ground surface.

Each individual natural gas production site for a single-well would be approximately 1.43 acres (250 feet by 250 feet) as shown in Figure 2-9. Typical completed (cased) well bore diagrams for Lance, Fox Hills, Lewis, and Almond Formation vertical wells are shown in Figure 2-10, Figure 2-11, Figure 2-12, and Figure 2-13 respectively.

Cut and fill slopes associated with each production well site would be reclaimed as prescribed in the APD/ROW. Each producing well would be serviced by its own production facility, unless consolidation of production facilities for closely spaced wells is technically and economically feasible. All wells would be manually operated, requiring daily site visits by a service vehicle.

Casing prevents drill hole cave-in and aquifer mixing, confines production to the well bore, and provides a means of controlling pressure to facilitate installation of surface and subsurface well equipment. A typical cased well bore consists of conductor pipe, surface casing, and production casing. Surface casing is set deep enough and cemented to the surface to protect freshwater aquifers. Surface casing is set at the start of drilling operations. Setting production casing and cementing it in place is designed to prevent gas, oil, condensate, or water from migrating from formation to formation and to isolate producing zones. Most completions in the project area use a string of tubing that is inserted in the casing to the top of the perforated productive zone to allow gas, condensate, and water to flow to the surface where it is collected, measured, and contained.

2.5.2.6 Production Estimates

The following are expected natural gas production performance estimations for the DFPA. Estimates are based on existing production within the DFPA and projections on future production based on the Proposed Action.

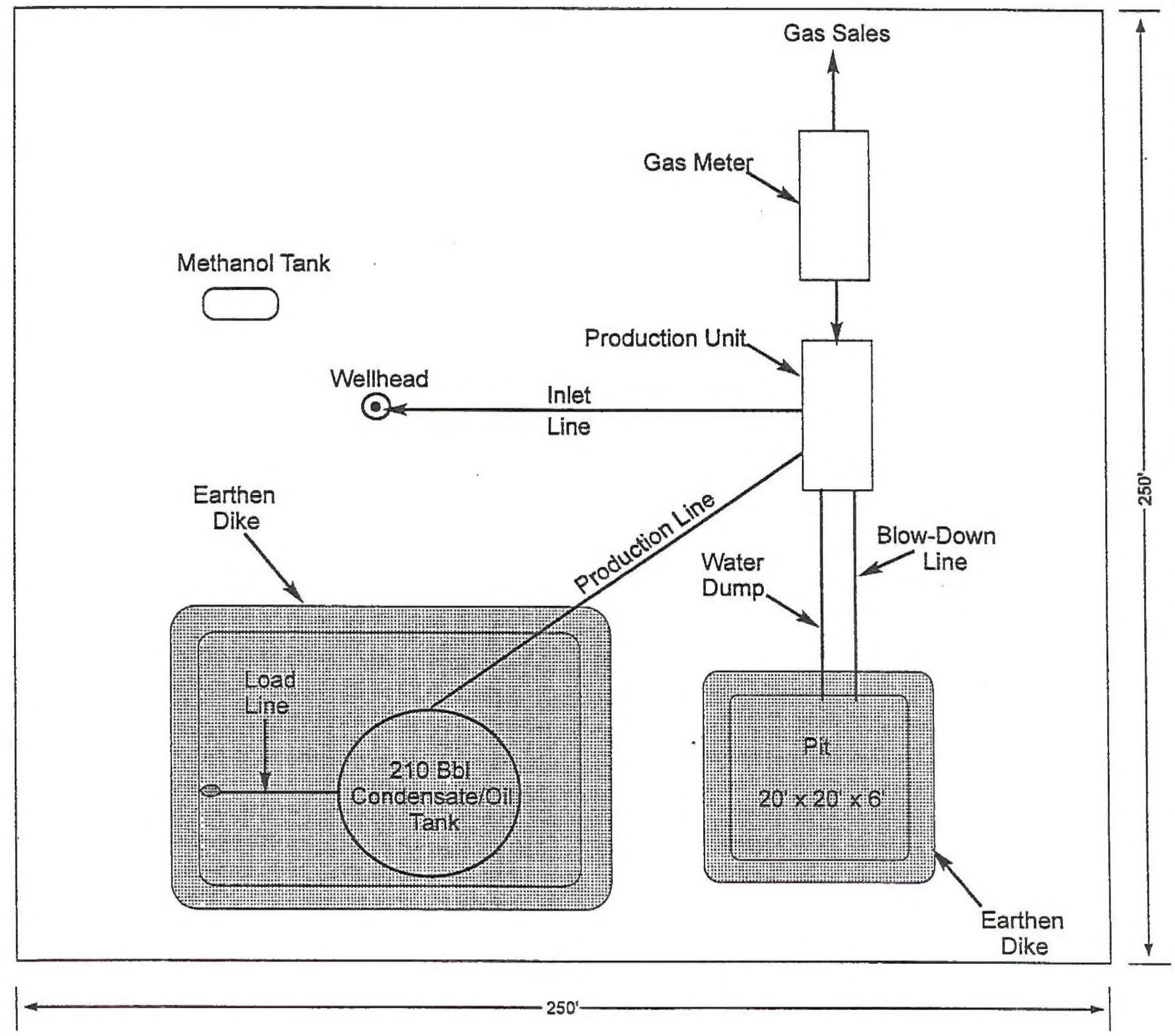


Figure 2-9. Production Facilities Installed at a Production Well Site - Lance/Fox Hills/Lewis and Almond Formations.

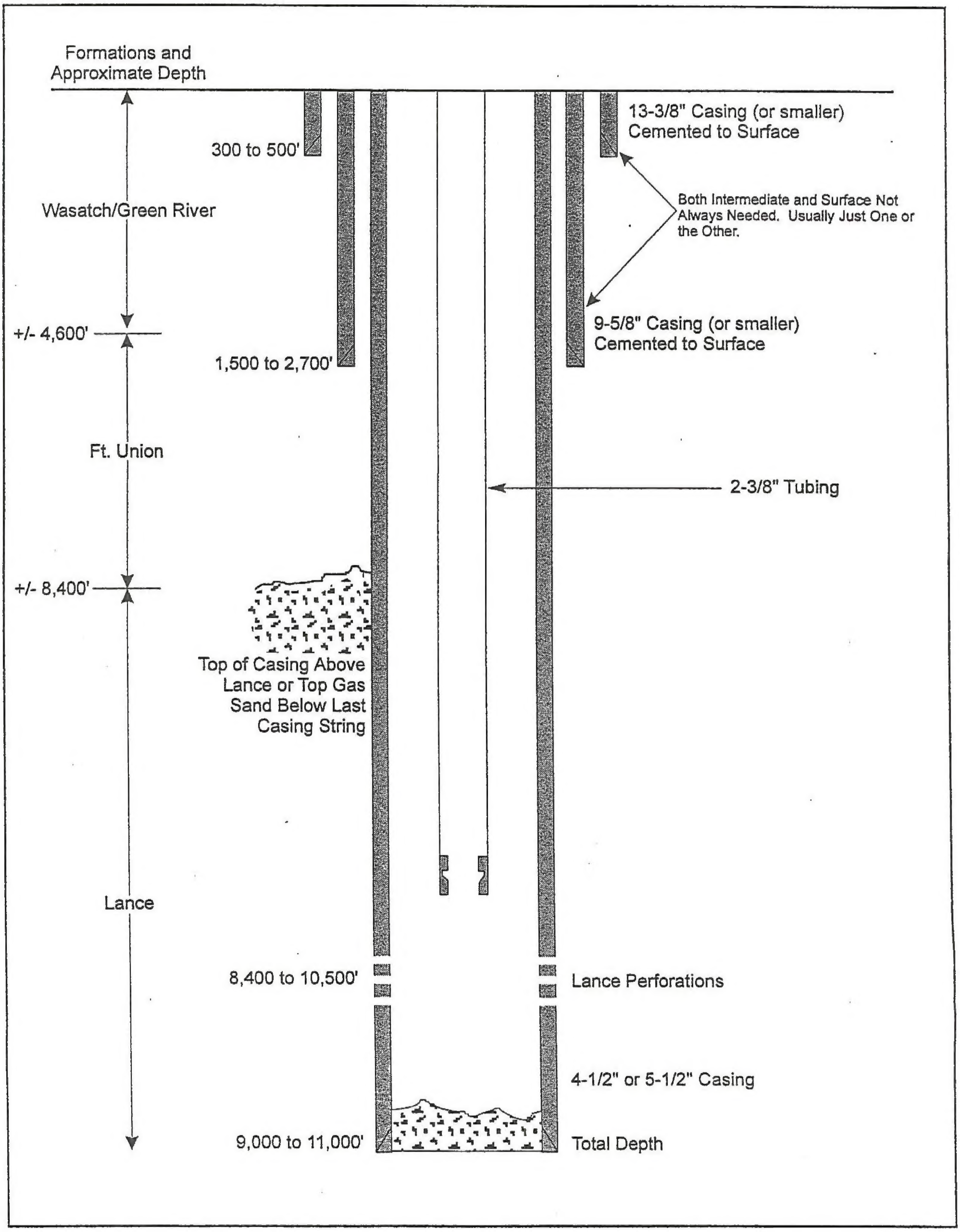


Figure 2-10. Typical Completed Wellbore Diagram for a Vertical Well - Lance Formation.

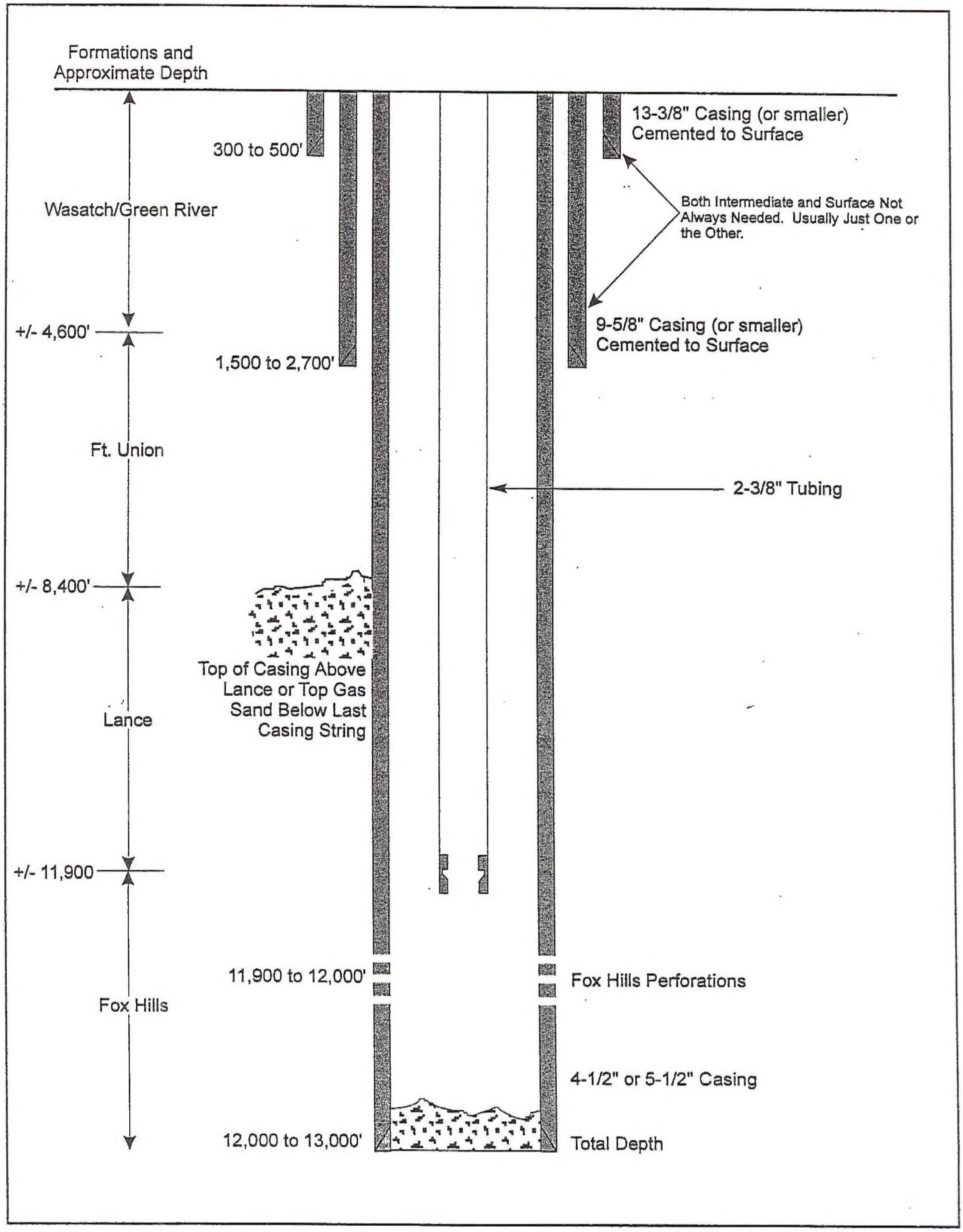


Figure 2-11. Typical Completed Wellbore Diagram for a Vertical Well - Foxhills Formation.

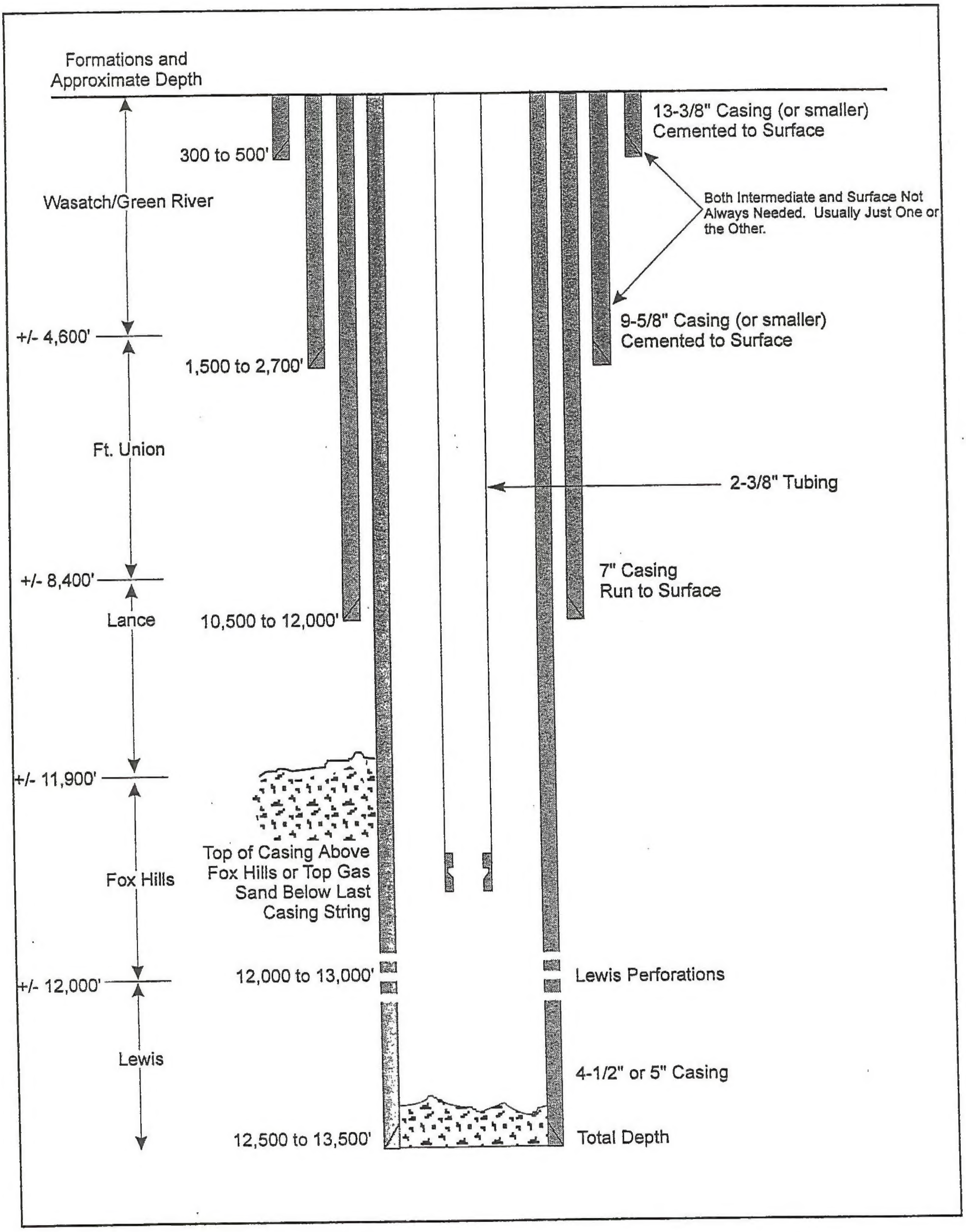


Figure 2-12. Typical Completed Wellbore Diagram for a Vertical Well - Lewis Formation.

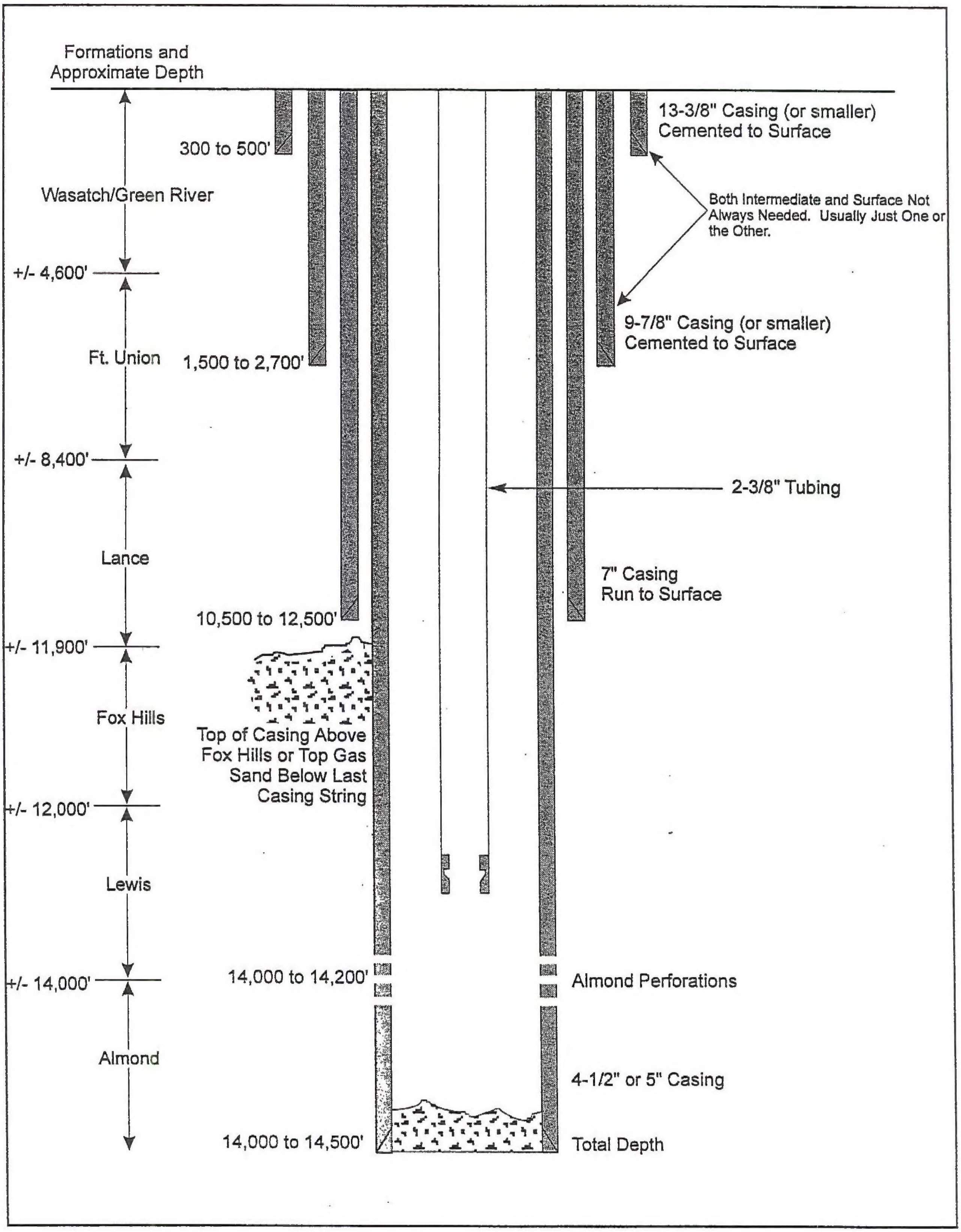


Figure 2-13. Typical Completed Wellbore Diagram for a Vertical Well - Almond Formation

- Original gas in-place: 12,000 billion cubic feet (BCF)
- Cumulative Production: 136 BCF
- Remaining recoverable reserves: 1,375 BCF

2.5.2.7 Estimated Employment Requirements

The estimated numbers of persons employed in various phases of the pre-drilling, construction, drilling, completion/testing and producing well services including pipeline construction are shown in Table 2-3. It should be noted that many of the personnel employed on different phases of the project are not employed full-time on an annual basis but are employed for shorter periods of time during which their skill or craft is required. In most cases, the length of time for each activity is indicated in addition to the expected time on-site for the different activities involved in field development. Employment numbers for vendors, BLM personnel, and some contractors are not included in these estimates. Note that because some personnel are assigned to multiple wells and some share vehicles, these estimates are not strictly comparable with those in Table 2-2.

2.5.2.8 Ancillary Facilities

The DFPA Operators and pipeline companies would construct ancillary facilities as necessary to meet production needs. Such facilities would include, but not be limited to (1) produced water disposal equipment, (2) individual well site compression, (3) individual well site liquids (hydrocarbon liquids) recovery units, (4) electrical power lines, (5) gas metering stations, (6) pipeline pigging facilities, (7) field storage buildings, and (8) cathodic protection facilities. The number and exact location of such ancillary facilities is not known at this time, but most would be installed within the boundaries of existing disturbances. For those facilities which would not be in existing disturbed areas, the Operators estimate that approximately 97 acres of new disturbance would occur.

2.5.2.9 Geophysical Operations

No additional geophysical operations are currently planned by the operators in the DFPA, but are possible in the future. If proposed, the effects would be analyzed in a separate analysis.

2.5.2.10 Site Restoration and Abandonment

The Operators propose to completely reclaim all disturbed areas not required for production activities including: (1) pipeline ROW, (2) portion of road ROW not required in the function of the road, and (3) the portion of the drill pad not required during production. Reclamation would generally include: (1) complete cleanup of the disturbed areas (drill sites, access roads, etc.); (2) restoration of the disturbed areas to the approximate ground contour that existed prior to construction; (3) ripping of disturbed areas to a depth of 12 to 18 inches; (4) replacement of topsoil over all disturbed areas; (5) seeding of reclaimed areas with the seed mixture prescribed in the Surface Use Plan or POD for the Proposed Action, and (6) fertilizing, if considered necessary by the BLM authorized officer.

Specific reclamation recommendations for use with the natural gas drilling and production operations within the project area are described in Appendix C. The final set of reclamation measures to be applied would be developed in the APD or ROW grant by each operator in consultation with the BLM and would be specific to each site and the conditions at that site.

Table 2-3. Workforce Categories, Numbers, Duration, and Commute Information

Employment Category	Employment	Duration
Pre-Approval & Permitting		**(Variable)**
Company personnel	2	Variable
Permitting contractor	1	Variable
Surveyors	2	Once/well
Resource specialists	Variable	Variable
Drilling		**(About 55 days/well)**
Road/drill site construction	3/well	5-7 days/well
Gravel haul	Variable	1-2 days/well
Rig transport & setup	15/well	4 days/well
Drilling engineer	1/well	
Rig Supervisor	1/well	Visits well weekly
Drilling foreman	2/well	55 days/well
Drilling Crew	2 crews of 5 each/well	55/days/well
Mud logger	1/well	40 days/well
Mud engineer	1/well	visits well once/week
Completion/Testing		**(About 20 days/well)**
Completion rig crew	2 crews of 4 /well	30 days/well
Casing crew	5/well	2 days/well
Cementing crew	4/well	2 days/well
Well testers	2/well	15 days/well
Perforators	2/well	2 days/well
Frac crew	2 crews of 15/well	2 days/well
Completion service	2/well	As needed
Field Development		**(Variable)**
Gathering system construction	12/mile	4 days/mile
Compressor station const.	12/station	7 days/station
Gas processing plant const.	24/plant	21 days
Tool pusher	1/well	55 days/well
Well service	2/well	As needed
Production (employment for field)		**(Life of Field)**
Production foreman	1	Life of field
Pumper	1	Life of field
Hauler	1	Life of field
Workover/maintenance	Variable (contractors)	As needed for life of field
Reclamation		**(As Needed)**
Reclamation crew	3	7 days/well

As indicated previously, many disturbances would be reclaimed. Disturbances associated with drill sites would thereby be reduced by reclaiming cut, fill, and soil stockpiling areas. The size of the remaining well pad would be 1.43 acres after reclamation. This would represent an approximate reduction of 1,108 acres of surface disturbance for all new well sites. All cross-country pipeline ROW's would be reclaimed representing an approximate reduction of 542 acres of disturbed area.

2.5.2.11 Project-Wide Mitigation Measures

Following are mitigation measures and agency required procedures on public lands to avoid or mitigate resource or other land use impacts. These measures would be applied on privately owned surface and State of Wyoming lands unless otherwise specified by the involved private and/or the State surface owners. An exception to a mitigation measure and/or design feature may be approved on public land on a case-by-case basis when deemed appropriate by the BLM. An exception would be approved only after a thorough, site-specific analysis determined that the resource or land use for which the measure was put in place is not present or would not be significantly impacted.

2.5.2.11.1 Preconstruction Planning and Design Measures

- The Operators and the BLM would make on-site ID inspections of each proposed and staked facility site (e.g., well sites), new access road, access road reconstruction, and pipeline alignment projects so that site-specific recommendations and mitigation measures can be developed.

- New road construction and maintenance of existing roads in the DFPA would be accomplished in accordance with BLM Manual 9113 standards unless private landowners or the State of Wyoming specify otherwise.

- The Operators would prepare and submit an APD for each drill site on federal leases to the BLM for approval prior to initiation of construction. Also prior to construction, the operators or their contractors would submit a Sundry Notice and/or ROW application for each pipeline and access road segment on federal leases. The APD would include a Surface Use Plan that would show the layout of the drill pad over the existing topography, dimensions of the pad, volumes and cross sections of cut and fill, location and dimensions of reserve pit, and access road egress and ingress. The APD, Sundry Notice, and/or ROW application plan would also itemize project administration, time frame, and responsible parties. In addition, a reclamation plan would be developed by the operators for each facility in consultation with the BLM.

- The Operators would slope-stake construction activities when required by the BLM (e.g., steep and/or unstable slopes) and receive approval from the BLM prior to start of construction.

2.5.2.11.2 Resource-Specific Requirements

The Operators propose to implement the following resource-specific mitigation measures and agency requirements:

Geology/Minerals/Paleontology

Paleontological resource values would be protected through the following mitigation measures:

- All areas of proposed ground disturbance within the MVMA would be surveyed by a qualified paleontologist prior to disturbance. Any mitigation measures proposed as a result of the survey would be developed in consultation with the BLM regional paleontologist.

- Outside of the MVMA, paleontologic detailed surveys would be conducted on areas of proposed ground disturbance underlain by the Washakie Formation and spot check survey would be conducted on areas of proposed ground disturbance underlain by the Browns Park Formation, Laney Member of the Green River Formation and Cathedral Bluffs Member of the Wasatch Formation. These areas are delineated in the paleontology report (EVG 2001) submitted to the BLM. Any mitigation measures proposed as a result of surveys would be evaluated by the BLM regional paleontologist for applicability.

- If paleontologic resources are discovered anywhere in the area anytime during construction, construction activities in the vicinity of the discovery would cease and BLM personnel would be notified immediately. Work would not resume until a qualified paleontologist has evaluated the discovery.

- Surface disturbing activities would be managed to avoid slopes greater than 25% and highly erosive areas.

Climate and Air Quality

- The Operators would not burn garbage or refuse at the drill sites or other facilities.

- When an air quality, soil loss, or safety problem is identified as a result of fugitive dust, immediate abatement would be initiated. The BLM would approve the procedure (e.g., application of water and magnesium chloride) for dust abatement at facility construction sites as well as locations for use and application rates. Water, if approved for this purpose, must be obtained by the Operator from State-approved source(s).

Soils

- Reduce the area of disturbance to the absolute minimum necessary for construction and production operations while providing for the safety of personnel. The operators would restrict off-road vehicle activity.

- Where feasible, buried pipelines would be located immediately adjacent to roads to avoid creating separate areas of disturbance and in order to reduce the total area of disturbance.

- The operators would avoid using frozen or saturated soils as construction material.

- The operators would minimize construction activities in areas of steep slopes and other sensitive soils, and apply special slope stabilizing structures if construction cannot be avoided in these areas.

- Design cutslopes in a manner that would allow retention of topsoil, surface treatment such as mulch, and subsequent revegetation.

- Selectively strip and salvage topsoil or the best suitable medium for plant growth from all disturbed areas to a depth of 12 inches, more if available, on all well pads.

- Where possible, minimize disturbance to vegetated cuts and fills on existing roads that are improved.

- Install runoff and erosion control measures such as water bars, berms, and interceptor ditches if required, as prescribed in Appendix C.

- Install culverts for ephemeral and intermittent drainage crossings. Design all drainage crossing structures to carry the 50-year discharge event, or as otherwise directed by the BLM.

- Implement minor routing variations during access road layout to avoid steep slopes adjacent to ephemeral or intermittent drainage channels. Maintain a 100-foot wide buffer strip of natural vegetation where possible (not including wetland vegetation) between all construction activities and ephemeral and intermittent drainage channels.

- Include adequate drainage control devices and measures in the road design (e.g., road berms and drainage ditches, diversion ditches, cross drains, culverts, out-sloping, and energy dissipators) at sufficient intervals and intensities to adequately control and direct surface runoff above, below, and within the road environment to avoid erosive concentrated flows. In conjunction with surface runoff or drainage control measures, use erosion control devices and measures such as temporary barriers, ditch blocks, erosion stops, mattes, mulches, and vegetative covers. Implement a revegetation program as soon as possible to re-establish the soil protection afforded by a vegetal cover.

- Upon completion of construction activities, restore topography to near pre-existing contours at the well sites, along access roads and pipelines, and other facilities sites. Replace up to 12 inches of topsoil or suitable plant growth material over all disturbed surfaces, and apply fertilizer as required, seed (specified in a reclamation plan), and mulch.

Water Resources

- The vast majority of the stream channels that occur within the DFPA are ephemeral (i.e., carry water only in direct response to snow melt or precipitation events). Streams receive little or no support from groundwater discharge to sustain flow and the few springs at higher elevations only sustain intermittent stream flow for short distances downstream. Operators should limit construction of drainage crossings to no-flow periods or low-flow periods.

- Minimize the area of disturbance within drainage channel environments.

- Prohibit construction of well sites, access roads, and pipelines within 500 feet of surface water and/or riparian areas. Exceptions to this would be granted by the BLM based on an environmental analysis and site-specific mitigation plans.

- Minor routing variations during access road layout would be implemented to avoid steep slopes adjacent to drainage channels. A 100-foot wide buffer strip of natural vegetation where possible (not including wetland vegetation) would be maintained between all construction activities and drainage channels.

- Culverts would be installed for all drainage crossings. All drainage crossing structures would be designed to carry a 50-year discharge event, or as otherwise directed by the BLM.

- Design channel crossings to minimize changes in channel geometry and subsequent changes in flow hydraulics.

- Maintain vegetation barriers occurring between construction activities and channels.

- Construction activities would be minimized in areas of steep slopes, and special slope stabilizing structures would be applied if construction can not be avoided in these areas.

- Runoff and erosion control measures would be installed such as water bars, berms, and interceptor ditches as required.

- Adequate drainage control devices and measures would be included in the road design (e.g., road berms and drainage ditches, diversion ditches, cross drains, culverts, out-sloping, and energy dissipators) at sufficient intervals and intensities to adequately control and direct surface runoff above, below, and within the road environment to avoid erosion concentrated flows. Erosion control devices would also be used in conjunction with the surface runoff and drainage control devices, such as temporary barriers, ditch blocks, erosion stops, mattes, mulches, and vegetative covers. A revegetation program would be implemented as soon as possible to re-establish the soil protection afforded by a vegetal cover.

- Design and construct interception ditches, sediment traps, water bars, and revegetation and soil stabilization measures if required.

- Construct channel crossings for buried pipelines such that the pipe is buried a minimum of four feet below the channel bottom.

- Regrade disturbed channel beds to the original geometric configuration with the same or very similar bed material.

- Upon completion of construction activities, the topography would be restored to near pre-existing contours at the well sites, along access roads, pipelines, and other facilities sites. Up to 12 inches of topsoil or suitable plant growth material would be replaced over all disturbed surfaces. Fertilizer, seed (specified in a reclamation plan), and mulch would be applied as required.

- The project must comply with RMP management directives that relate to protection of water resources identified in Section 4.4.2 These regulations require avoidance of stream channels to the maximum practicable extent. Where total avoidance is not practicable, then minimization of impacts to streams must be implemented. Where streams cannot be avoided, the Operators would be required to show the BLM AO why such resources cannot be totally avoided and how impacts would be minimized during the APD process.

- Case wells during drilling, and case and cement all wells in accordance with On-Shore Order No. 2 to protect accessible high quality aquifers. High quality aquifers are aquifers with known water quality of 10,000 ppm TDS or less. Include well casing and welding of sufficient integrity to contain all fluids under high pressure during drilling and well completion. All wells would be cemented in compliance with specifications contained in the APD.

- Reserve pits would be constructed so that a minimum of one-half of the total depth is below the original ground surface on the lowest point within the pit.

- In non-critical areas, and when a fresh water based mud system is being used, the Operators propose to use an unlined earthen reserve pit. Earthen reserve pits would be used only after evaluation of the pit location for distance to surface waters, depth to useable ground water, soil type and permeability, and after evaluation of the fluids which would likely be retained in the pit. If deemed necessary during the individual well site APD review, the reserve pit would be lined with an impermeable liner to prevent seepage. Bentonite or impermeable lining would be used where appropriate as defined during APD review. The synthetic liner would be at least 12 mils (12,000ths of an inch) thick, reinforced with a bursting strength of 174 x 175 pounds per inch (ASTMD 75719), resistant to decay from sunlight and hydrocarbons and compatible with the drilling fluids to be retained.

- Maintain 2 feet of freeboard on all reserve pits to ensure the reserve pits are not in danger of overflowing. Shut down drilling operations until the problem is corrected if leakage is found outside the pit.

- Remove any hydrocarbons floating on the surface of the reserve pit as soon as possible after drilling operations are complete.

- Extract hydrostatic test water used in conjunction with pipeline testing and all water used during construction activities from sources with sufficient quantities and through appropriation permits approved by the State of Wyoming.

- Hydrostatic test water will be reused where possible and/or discharged in a controlled manner onto an energy dissipator. The water is to be discharged onto undisturbed land that has vegetative cover, if possible, or into an established drainage channel. Prior to discharge, treat or filter the water to reduce pollutant levels or to settle out suspended particles if necessary. If discharged into an established drainage channel, the rate of discharge would not exceed the capacity of the channel to safely convey the increased flow. Coordinate all discharge to test water with the SEO and the BLM.

- Discharge all concentrated water flows within access road ROW's onto or through an energy dissipator structure (e.g., riprapped aprons and discharge points) and discharge into undisturbed vegetation.

- Develop and implement a PPP for storm water runoff at drill sites as required per WDEQ storm water NPDES permit requirements.

- The Operators must coordinate with the COE to determine the specific CWA Section 404 Permit requirements and conditions (including the potential requirement of compensatory

mitigation) for each facility that occurs in Waters of the U.S. to prevent the occurrence of significant impact to such waters.

- Exercise stringent precautions against pipeline breaks and other potential accidental discharges of toxic chemicals into adjacent streams. If liquid petroleum products storage capacity exceeds criteria contained in 40 CFR Part 112, an SPCC plan would be developed in accordance with 40 CFR Part 112.

- The project must comply with all aspects of the CWA. An NPDES permit would be required for the project. The permit would require the Operators to develop a surface runoff, erosion, and sedimentation control plan, oil spill containment and contingency plan, as well as other environmental protection plans to ensure that the opportunity of probability of water pollution is minimized.

Fisheries

- If any water depletion to the Colorado River System is anticipated, formal consultation with the FWS will be undertaken and a Biological Opinion obtained to offset possible downstream impacts on Threatened and Endangered fish species.

Vegetation and Wetlands

- Seed and stabilize disturbed areas with mixtures and treatment guidelines prescribed in the approved APD/ROW.

- Evaluate all project facility sites for occurrence and distribution of waters of the U.S., special aquatic sites, and jurisdictional wetlands. All project facilities would be located out of these sensitive areas. If complete avoidance is not possible, minimize impacts through modification and relocations. Coordinate activities that involve dredge or fill into wetlands with the COE.

- Conduct site-specific surveys for federally listed threatened and endangered (T&E), candidate and proposed plant species, and BLM Wyoming State Director sensitive species prior to any surface disturbance in areas determined by the BLM to contain potential habitat for such species. If such plant species or their habitat are found during the surveys, adjustments to the location of project facilities would be made to avoid the plant species and/or their habitat. Copies of these surveys would be provided to the BLM.

Invasive/Non-Native Species

- Incorporate invasive/noxious weed management strategies into the preconstruction planning and design process for all surface disturbance activities including road, pipeline, well pad and ancillary facility construction.

- Stabilize disturbed areas and reestablish vegetation on all bare ground using mixtures and treatment guidelines prescribed in the approved APD/ROW as soon as practical to minimize weed spread.

- File noxious weed monitoring forms with the BLM and implement, if necessary, a weed control and eradication program.

- On BLM lands, an approved Pesticide Use Proposal would be obtained before the application of herbicides or other pesticides for the control of noxious weeds.

Range Resources and Other Land Uses

- The Operators would coordinate with the affected livestock operators to ensure that livestock control structures remain functional during drilling and production operations.

- Replace damaged livestock control structures as soon as possible with structures constructed to BLM standards.

- In the event a pipeline trench three-quarters of a mile or more in length is left open over night, plugs will be installed at one-quarter mile intervals to allow livestock and wildlife, which may have fallen into the trench, to escape.

Wildlife

- No disturbance would occur in habitats designated as crucial big game winter range between November 15 and April 30.

- Within big game crucial winter ranges, disturbances would be placed so that specific important vegetation types, as identified by the BLM, would be avoided where possible.

- During reclamation, establish a variety of forage species that are useful to resident herbivores by specifying the seed mixes in the approved APD/ROW.

- No surface disturbance would be allowed within 1/4 mile of greater sage-grouse leks unless they are considered historic (have not been used in the past 7-10 years).

- No surface disturbance will occur within two miles of an active or known greater sage-grouse lek between March 1 and June 30.

- No surface disturbance would be allowed within identified patches of greater sage-grouse severe winter relief habitat.

- No disturbance would be allowed during the critical nesting season (Feb 1 - July 31, depending on species) within 1 mile of an active nest of listed or sensitive raptor species, and 3/4 - ½ mile (depending upon species or line of sight) of an active nest of other raptor species. The nature of the restrictions and the protection radius would vary according to the raptor species involved and would be determined by the BLM.

- In the event of a "taking" of a raptor nest, all appropriate permits would be acquired.

- Where construction within potential mountain plover habitat is scheduled to occur between April 10 and July 10, mountain plover surveys would be conducted according to current FWS guidelines.

- Well pads and disturbances would be placed outside of potential mountain plover habitat where feasible.

- Should mountain plovers or mountain plover nests be found within 200 m of a proposed well or disturbance area, construction activities would be postponed until at least 1 week post hatching, and the site would be monitored during the following nesting season to determine whether or not the plovers return.

- Additional stipulations may be required if known occupied mountain plover habitat areas are to be disturbed.

- If disturbance of prairie dog colonies located within complexes that contain potential black-footed ferret habitat (Biggins et al. 1989) can not be avoided, black-footed ferret surveys would be conducted according to FWS guidelines (USDI-FWS 1989).

- Well pads and disturbances would be placed outside of (50 m) prairie dog colonies where feasible.

- Should black-footed ferrets be documented in a prairie dog complex located within the project area, impact to the species or its habitat would be completely avoided, and all previously authorized project-related activities on-going in the prairie dog complex would be suspended immediately.

- The BLM and operators would conduct educational outreach to employees regarding the nature, hosts, and symptoms of canine distemper, and its effects on black-footed ferrets, focusing attention on why employees should not have pets on work sites during or after hours.

- All suspected observations of black-footed ferrets, their sign, or carcasses on the DFPA, however obtained, would be promptly (within 24 hours) reported to the BLM and FWS.

- Operators would Prohibit unnecessary off-site activities of operational personnel in the vicinity of the drill sites.

- Project employees would be informed of applicable wildlife laws and penalties associated with unlawful take and harassment of wildlife.

- Regular drivers would undergo training describing the types of wildlife in the area that are susceptible to vehicular collisions, the circumstances under which such collisions are likely to occur, and the measures that can be employed to minimize them. Reduced speed limits would be implemented to reduce potential for vehicle-wildlife collisions.

- Carcasses of road-killed animals and birds would be removed from access roads, shoulders, and the ROW's to minimize bald eagle exposure to vehicles.

- To protect migratory birds and wildlife in general, all reserve pits and other pits and areas that contain potentially hazardous materials would be fenced and netted, in accordance with BLM requirements.

Recreation

- Minimize conflicts between project vehicles and equipment and recreation traffic by posting appropriate warning signs, implementing operator safety training, and requiring drivers of project vehicles to adhere to low speed limits.

Visual Resources

- Utilize existing topography to screen roads, pipeline corridors, drill rigs, well heads, and production facilities from view.

- Paint well and central facilities site structures with flat colors that blend with the adjacent surrounding undisturbed terrain, except for structures that require safety coloration in accordance with Occupational Safety and Health Administration (OSHA) requirements. The color selected for this project is Carlsbad Canyon.

Cultural Resources

- If a site is considered eligible for, or is already on the National Register of Historic Places (NRHP), avoidance is the preferred method for mitigating adverse effects to that property.

- Mitigation of adverse effects to cultural/historical properties that cannot be avoided would be accomplished by the preparation of a cultural resources mitigation plan.

- If cultural resources are discovered at any time during construction, all construction activities would cease and BLM personnel would be immediately notified. Work would not resume until a Notice to Proceed is issued by the BLM.

Socioeconomics

- Implement hiring policies that would encourage the use of local or regional workers who would not have to relocate to the area.

- Coordinate project activities with ranching operations to minimize conflicts involving livestock movement or other ranch operations. This would include scheduling of project activities to minimize potential disturbance of large-scale livestock movements. Establish effective and frequent communication with affected ranchers to monitor and correct problems and coordinate scheduling.

Health and Safety

- Sanitation facilities installed on the drill sites and any resident camp site locations would be approved by the WDEQ.

- To minimize undue exposure to hazardous situations, require measures that would preclude the public from entering hazardous areas and place warning signs alerting the public of truck traffic.

- At all construction and operations locations, require all trash, waste and unused materials to be promptly stored in appropriate containers, and all containers, drums, pallets, etc. to be secured to prevent them from blowing off-site.

- Haul all garbage and rubbish from the drill site to a State-approved sanitary landfill for disposal. Collect and store any garbage or refuse materials on location prior to transport in closed containers.

- During construction and upon commencement of production operations, the operators would have a chemical or hazardous substance inventory for all such items that may be at the site. The operators would institute a Hazard Communication Program for its employees and would require subcontractor programs in accordance with OSHA 29 CFR 1910.1200. These programs are designed to educate and protect the employees and subcontractors with respect to any chemicals or hazardous substances that may be present in the work place. It would be required that as every chemical or hazardous material is brought on location, a Material Safety Data Sheet (MSDS) would accompany that material and would become part of the file kept at the field office as required by 29 CFR 1910.1200. All employees would receive the proper training in storage, handling, and disposal of hazardous substances.

- SPCC Plans would be written and implemented as necessary in accordance with 40 CFR Part 112 to prevent discharge into navigable waters of the United States.

- Immediately upon discovery of any leaks, ruptures, spills or releases, notify the BLM (per Hazardous Substances Spill Plan for NTL-3A incidents) and appropriate local, state and other federal agencies, and conduct containment and clean-up activities as required by appropriate local, state and federal regulations.

- Chemical and hazardous materials would be inventoried and reported in accordance with the Superfund Amendments and Reauthorization Act (SARA) Title III. 40 CFR Part 335, if quantities exceeding 10,000 pounds or the threshold planning quantity (TPQ) are to be produced or stored in association with the Proposed Action. The appropriate Section 311 and 312 forms would be submitted at the required times to the State and County Emergency Management Coordinators and the local fire departments.

- Waste oils and hazardous wastes, as defined by the Resource Conservation and Recovery Act (RCRA), would be transported and/or disposed of in accordance with all applicable federal, state, and local regulations.

  The Operators plan to design operations to severely limit or eliminate the need for Extremely Hazardous substances. The operators also plan to avoid the creation of hazardous wastes as defined by RCRA wherever possible.

  Appendix D (Hazardous Substance Management Plan) provides a summary of the hazardous chemicals that may be on a drilling or production site with examples of representative chemicals and associated physical and health hazards. At this time it is impossible to determine if these items would be stored in sufficient quantities to require reporting under SARA Title II, and in some cases, the items may not be on site at all. However, all items would become part of the Hazard Communications Plan where required, and employee training would be completed as required.

- During site reclamation, remove and properly dispose of all fluids from pits, drums, tanks, compressors and other sources.

Noise

- Muffle and maintain all motorized equipment according to manufacturers' specifications.

2.6 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

The Council on Environmental Quality regulations implementing NEPA require BLM to rigorously explore and objectively evaluate all reasonable alternatives and to briefly explain the reasons for any alternatives that are eliminated from detailed study (40 CFR 1502.14(a)). Two alternatives were considered but dropped from study for the reasons described below.

2.6.1 Expanded Wilderness Alternative

The RFO and RSFO received a proposal entitled "A Citizens' Wilderness Inventory of Adobe Town" (Citizens' Proposal) in August, 2001. The Citizens' Proposal requested that the BLM consider additional lands surrounding the Adobe Town WSA for wilderness status. All lands contained in the Citizens' Proposal are contiguous to the existing Adobe Town WSA. Lands contained in the Citizens' Proposal include public lands in both the RFO and RSFO that are within the DFPA.

An alternative was considered to analyze the Citizens' Proposal to evaluate lands surrounding the Adobe Town WSA for wilderness status. This alternative was eliminated from further consideration and detailed study because the proposal would be more appropriately addressed within the context of the BLM's land use plan review process. In addition, to delay the Desolation Flats Natural Gas Field Development Project, or require that the proponents complete land use planning analysis of the Citizens' Proposal would not be appropriate within the context of a project-specific EIS.

The lands identified in the Citizens' Proposal for consideration as wilderness were originally included in a review of public lands conducted by the BLM in 1980. These lands were found not to contain the wilderness qualities necessary for consideration as wilderness and were eliminated from further analysis.

The information provided in the 'Citizens' Proposal' was evaluated by RFO and RSFO in late 2001. Certain public lands outlined in the Citizens' Proposal, including those lands within the DFPA, were found to contain sufficient human intrusions to preclude wilderness characteristics and have been eliminated from further consideration. Other public lands included in the Citizens' Proposal may have wilderness characteristics. The RFO will evaluate the Citizens' Proposal through the RMP revision process currently underway for the Great Divide RMP (USDI-BLM 1987, 1988a, 1990a). The RSFO will evaluate the Citizens' Proposal through a planning review and document the review using an appropriate NEPA document.

The ongoing oil and gas development within the Citizens' Proposal is consistent with the RFO Great Divide ROD and Approved RMP (USDI-BLM 1990a), and the RSFO ROD and Green River RMP (USDI-BLM 1997). Oil and gas development is also consistent with the Mulligan Draw Gas Field Project ROD (USDI-BLM 1992b) that covers a portion of the DFPA. Prior to completion of the Great Divide RMP revision process, any application for development received by the RFO within that portion of the Citizens' Proposal found by the BLM to contain wilderness values, would

be considered through a site-specific NEPA analysis. If proposed development activities were found to impair wilderness values, the application would be denied until completion of the Great Divide RMP revision. Any application received by the RSFO would be considered through the planning review process and possible plan amendment.

2.6.2 Directional Drilling

The DFPA Operators feel that in certain circumstances, where the need arises to vacate the drilling of a vertical well, a directional (i.e., directional, horizontal, diagonal) well could be utilized for resource protection. This approach is outlined in the Proposed Action and Alternative A where a portion of the wells proposed for drilling may be directionally drilled. Circumstances that may result in directional drilling within the DFPA would include but not be limited to: adverse topographical features; a high density of cultural/historical material that would require in-depth testing and excavation; Historical Trail viewshed considerations; and avoiding habitats of threatened, endangered, or other sensitive species. These circumstances would arise at the APD stage, and economic evaluation for those particular instances would be conducted at that time to determine whether or not a directional well would be utilized.

Union Pacific Resources Company (UPRC) drilled 17 diagonal wells from central pad sites in the Wamsutter Field from 1994 to 1999. The Wamsutter Field is located north of the DFPA (Figure 1-6). Drilling conditions previously experienced within the DFPA are similar to those encountered in the Wamsutter Field. The vertical displacement or directional reach of these wells ranged from 250 feet to 2,450 feet with deviations ranging from 15 degrees to 32 degrees. The first two wells were drilled with build and hold configurations where the wellbores were deviated at a 20 to 30-degree angle as they penetrated the reservoir. Significant completion problems were experienced with this configuration so the well plans were changed to a build - hold and drop (S-shaped) configuration with the wellbore being vertical as it penetrated the reservoir. Fracture stimulation is the most important component of completing a successful well, therefore, any imposed stresses that would reduce the fracture effectiveness are unacceptable. No completion problems were experienced with the S-shaped wellbores, therefore, this configuration was accepted as the preferred method of directionally drilling in the Wamsutter Field.

In view of the opportunity that some percentage of the wells proposed by the operators would be directionally drilled, an alternative was considered that required that all wells be drilled from multi-well pads. The following discussion provides support why the directional drilling only alternative was eliminated from detailed study.

Experience in the Wamsutter Field

The application of directional drilling is geologically and mechanically limited. In most cases of multiple gas zones, the hole must be vertical when it penetrates the zones. When more than one hole per pad is drilled, the tanks necessary to handle the volume of production must be adjusted and therefore may be larger or there may need to be more tanks on one location to satisfy the multiple wells from one pad. The dehydrator and separator size will also increase. Multiple wells per pad do not translate into a direct reduction in surface disturbance.

Economics

The purpose of directional drilling wells in the Wamsutter Field was to evaluate the potential cost savings between drilling 4 wells from one location versus drilling 4 separate locations. This

objective was not met as the total cost to drill, complete, and equip a 4-well-pad location was typically 15 to 20 percent higher than 4 separate locations. Unfortunately, directional drilling does not increase the reserves associated with the well. Therefore, at the existing gas price the economics of the project were not feasible, and the concept was abandoned. Reserve estimates in the Wamsutter Field are relatively minute in comparison to the world class reservoirs of the Gulf Coast or North Sea where directional drilling is routine; however, such increases in the cost to recover these reserves results in unfavorable economics.

The additional cost to directionally drill a well is a function of the vertical distance between the surface location and the proposed bottom hole location. The longer the vertical distance, the greater the need for directional steering equipment. This inherently slows down the penetration rate. The wells directionally drilled by UPRC typically took 30 to 40 percent longer to drill than vertical wells of similar depths. Additional costs associated with these services include directional steering equipment and personnel, higher quality mud systems, more drill bits, and more rig days.

The potential loss of natural gas for the nation's energy needs is higher with directional drilling due to the rising cost impact on the reserves potentially left in the ground. As the costs accelerate, the exploration and drilling budgets get stretched. Fewer wells are drilled, less seismic work is done, and much less gas is found and produced. In some cases, the gas may not be recovered because the cost of drilling directional wells would render the project uneconomic, which would in-turn render the lease uneconomic.

Technical Limits

Current technologies, along with large reserves, make it possible in some parts of the world to drill to a bottom hole location several miles from the surface location. With the right drilling rig, drill pipe, casing programs, mud systems, and directional steering equipment this can be achieved in other areas. However, in the Wamsutter Field, and natural gas producing areas near Wamsutter Field (including the DFPA), there are mechanical limits associated with the standard drilling equipment available.

The average vertical displacement of the UPRC's 17 directionally-drilled wells in the Wamsutter Field is 1,425 feet. Torque and drag calculations, based on the same rig equipment capabilities and the same casing program, indicate that the maximum attainable vertical displacement before reaching the mechanical limits of the drill pipe is 6,200 feet. The maximum deviation in this case would be 50 degrees. Even if the well could be drilled it would be highly uneconomical at current reserve estimates and gas prices because the additional drilling costs would be higher than normal.

2.7 COMPARISON OF ENVIRONMENTAL IMPACTS OF FIELD DEVELOPMENT ALTERNATIVES

2.7.1 Comparison of Field Development Alternatives

A summary of impacts for the Proposed Action, Alternative A, and the No Action Alternative, analyzed in this EIS is provided in Table 2-4. A detailed analysis of project impacts and mitigation measures is presented in Chapter 4.

Table 2-4. Comparative Impact Summary.

RESOURCE ELEMENT	PROPOSED ACTION	ALTERNATIVE	
		A	B-No Action
General			
Proposed Disturbance (acres)			
Ancillary Facilities	97.0	161.0	0
Well Sites	1440.0	2,220.0	312.0
Pipelines	758.0	1,166.0	164.0
New & Upgraded Roads	2624.0	4,035.0	567.0
Disturbance - Project Area (acres) before reclamation after reclamation	 4,923.0 2,139.0	 7,582.0 3,300.0	 1043.0 441.0
Range Resources	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP	YES	YES	YES
AUM's Lost Following Reclamation	170.0	266.0	36.0
Air Quality	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP's and FLPMA	Yes	Yes	Yes
Compliance with State and National Ambient Air Quality Standards	Yes	Yes	Yes
Hazardous Air Pollutant Concentrations	NSI	NSI	NSI
Direct Visibility Impacts to Sensitive Areas (0.5 delta-deciview threshold)	NSI	NSI	NSI
Transportation	**NSI**	**NSI**	**NSI**
Compliance with RMP	YES	YES	YES
Traffic Volume (ADT relative to 2000 data) I-80 WYO 789 CO 13	Increase of ADT: <1% 2-3% (summer 4-6%) 2%	Increase of ADT: <1% 3-4% (summer 6-8%) 3%	Increase of ADT: <1% 1-2% (summer 2-3%) 1%
Minerals/Paleontology	**NSI w/ mitigation**	**NSI w/mitigation**	**NSI w/mitigation**
Compliance with RMP's	YES	YES	YES
Disturbance to Fossil Resources	NSI if avoided	NSI if avoided	NSI if avoided
Soils	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP's	YES	YES	YES
Total Surface Disturbance within the Project Area within the CIA Area	 0.9 percent 1.6 percent	 1.4 percent 2.1 percent	 0.2 percent 1.3 percent
Erosion: Year 1 (tons/year) w/ Effective Erosion Control	9,711	14,951	Less than Proposed Action

RESOURCE ELEMENT	PROPOSED ACTION	ALTERNATIVE	
		A	B-No Action
Additional Erosion: Year 5 (tons/year) w/ Effective Erosion Control	1,999	3,077	Less than Proposed Action
Compliance with EO 11987 (reclamation)	YES	YES	YES
Water Resources	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP's	YES	YES	YES
Compliance with CWA and State Water Quality Standards	YES	YES	YES
Groundwater Quality Degradation Potential	Improbable	Improbable	Improbable
Fisheries	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP	YES	YES	YES
Vegetation & Wetlands	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP	YES	YES	YES
Compliance with Section 404 of the CWA, EO 11990 (wetlands)	YES	YES	YES
Special Status Plants	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Wildlife	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP's, FWS, and WGFD objectives and stipulations	YES	YES	YES
Big Game Crucial Winter Range	NSI w/ mitigation	NSI w/ mitigation	NSI w/ mitigation
Greater Sage-grouse Leks, Nesting & Severe Winter Relief Habitats	NSI w/ mitigation	NSI w/ mitigation	NSI w/ mitigation
Raptor Nesting Habitat	NSI w/ mitigation	NSI w/ mitigation	NSI w/ mitigation
Special Status Wildlife & Fish			
Compliance with RMP's and FWS: Animals and Fish	YES	YES	YES
Potential Disturbance to FWS Listed & Proposed Wildlife Species			
Black-Footed Ferret	NSI w/ mitigation	NSI w/ mitigation	NSI w/ mitigation
Canada Lynx	NSI w/ mitigation	NSI w/ mitigation	NSI w/ mitigation
Bald Eagle	NSI w/ mitigation	NSI w/ mitigation	NSI w/ mitigation
Mountain Plover	NSI w/ mitigation	NSI w/ mitigation	NSI w/ mitigation
Potential Disturbance to Special Status Fish	NSI w/ mitigation	NSI w/ mitigation	NSI w/ mitigation

RESOURCE ELEMENT	PROPOSED ACTION	ALTERNATIVE	
		A	B-No Action
Visual Resources	**Potential SI**	**Potential SI**	**Potential SI**
Compliance with RMP's	Conditional	Conditional	Conditional
Compliance with BLM VRM Class	Conditional Potential long-term SI in MVMA NSI in Class III VRM areas	Conditional Potential long-term SI in MVMA NSI in Class III VRM areas	Conditional Potential long-term SI in MVMA NSI in Class III VRM areas
Noise	**NSI**	**NSI**	**NSI**
Compliance with RMP	No standards specified	No standards specified	No standards specified
Construction and Traffic Noise	Moderate	Higher than Proposed Action	Lower than Proposed Action
Recreation/Wilderness	**Potential SI**	**Potential SI**	**Potential SI**
Compliance with RMP's	YES	YES	YES
Quality of Recreation/Wilderness Experience	Mostly Moderate Impact SI in MVMA (23 sq/mi)	Higher than Proposed Action	Lower than Proposed Action
Displacement of Recreation/Wilderness Activities	Moderate Impact	Higher than Proposed Action	Low Impact
Socioeconomics	**NSI, Positive**	**NSI, Positive**	**NSI**
Compliance with RMP	No standards specified	No standards specified	No standards specified
Employment Rate	Increase	Higher than Proposed Action	Lower than Proposed Action
Tax & Royalty Revenue over 40 years (Ad valorem, federal mineral royalty, WY severance tax, and sales & use tax)	$550,000,000	$846,000,000	Lower than Proposed Action
Cultural Resources	**NSI w/ mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP's	YES	YES	YES
Compliance with the NRHP[2] guidelines	YES	YES	YES
Sites Eligible for the NRHP in the DFPA	216	Same as Proposed Action	Same as Proposed Action
Impacts to Known or Anticipated Cultural Resources	NSI if avoided	NSI if avoided	NSI if avoided
Health & Safety	**NSI w/mitigation**	**NSI w/ mitigation**	**NSI w/ mitigation**
Compliance with RMP's	YES	YES	YES
Risk to the Public	Moderate to Low	Higher than Proposed Action	Lower than Proposed Action

Abbreviations:

ADT	- Average daily traffic	**NSI**	- No significant impacts
AUM	- Animal Unit Month	**RMP**	- Resource Management Plan
CIA	- Cumulative Impacts Analysis	**SI**	- Significant impacts
CWA	- Clean Water Act	**VRM**	- Visual Resource Management
EO	- Executive Order	**WGFD**	- Wyoming Game and Fish Department
FWS	- Fish and Wildlife Service	**w/**	- with

CHAPTER 3

AFFECTED ENVIRONMENT

CHAPTER 3

AFFECTED ENVIRONMENT

3.0 INTRODUCTION

The Affected Environment chapter of this EIS for the proposed Desolation Flats natural gas development project discusses environmental, social, and economic factors as they currently exist within the DFPA. The material presented here has been guided by management issues identified by the BLM, Rawlins and Rock Springs field offices; public scoping; and by interdisciplinary field analysis of the area.

This proposal could potentially affect critical elements of the human environment as listed in BLM's National Environmental Policy Act (NEPA) Handbook H-1790-1 (USDI-BLM 1988b). The critical elements of the human environment, their status in the DFPA and their potential to be affected by the proposed project are listed in Table 3-1.

Table 3-1. Critical Elements of the Human Environment[1].

Element	Status on the DFPA	Addressed in text of EIS
Air quality	Potentially affected	Yes
Areas of critical environmental concern	Potentially affected	Yes
Cultural resources	Potentially affected	Yes
Environmental justice	None present	No
Prime or unique farmlands	None present	No
Floodplains	None present	No
Native American religious concerns	Potentially affected	Yes
Invasive, non-native species	Potentially affected	Yes
Threatened and endangered species	Potentially affected	Yes
Hazardous or solid wastes	Potentially affected	Yes
Water quality (surface and ground water)	Potentially affected	Yes
Wetlands/riparian zones	Potentially affected	Yes
Wild and scenic rivers	None present	No
Wilderness	None present	No

[1] As listed in BLM National Environmental Policy Act Handbook H-1790-1 (BLM 1988b) and subsequent Executive Orders

CHAPTER 3: AFFECTED ENVIRONMENT

3.1 GEOLOGY/MINERALS/PALEONTOLOGY

3.1.1 Geology

3.1.1.1 Regional Geologic Overview

The DFPA lies within the Washakie Basin, the easternmost subbasin of the Greater Green River Basin. Part of the Wyoming Basin Physiographic Province, the Washakie Basin is a structural basin bounded by mountain or arch uplifts. It is bounded to the east by the Sierra Madre, to the north by the Wamsutter Arch, to the west by the Rock Springs Uplift, and to the south by Cherokee Ridge. The basin is approximately 42 miles north to south and 54 miles west to east and includes an area of roughly 2,200 mi^2. Surface elevations in the basin range from about 6,100 to 8,700 feet and average about 7,000 feet.

The Washakie Basin began developing as a structural basin about 70 million years ago during the late Cretaceous Period. Its axis trends northeast-southwest and Cretaceous rocks dip inward at approximately 8 degrees along its eastern flank and about 15 degrees along its western flank (Love 1970). During the late Cretaceous and early Tertiary the basin filled with sediments eroded from surrounding highlands and mountains. Cretaceous and Tertiary sedimentary rocks comprise a great thickness in the basin. Depth to Late Cretaceous rocks in the basin central exceeds 16,000 feet and Precambrian basement rocks lie at depths greater than 32,000 feet.

The DFPA is underlain by Phanerozoic sedimentary rocks, that with the exception of lacking Silurian and Ordovician age deposits, range in age from Quaternary to Cambrian. These sediments are underlain by Precambrian metamorphic bedrock that comprise part of the ancient North American cratonic shield and probably exceeds 2 billion years in age. A geologic map of the DFPA is shown in Figure 3-1. Information on the geologic units preserved beneath the project area is provided in Table 3-2. Stratigraphic relationships of post Frontier Cretaceous units are quite complicated and rock names used vary across the area and this complexity is reflected in the table.

Geologic mapping by the USGS and Wyoming Geologic Survey (Bradley 1964, Love 1970, Love and Christiansen 1985, Love et al. 1993, and Roehler 1973, 1977, 1985) document that sedimentary deposits of Quaternary and Tertiary age crop out in the project area. More detailed information on these deposits is provided below and in Table 3-3.

<u>Quaternary Deposits</u>

A variety of unconsolidated or semi-consolidated sediments of Quaternary age occur at the surface of the project area. These sediments include: alluvium, colluvium, terrace gravel, wind blown sand, and loess.

<u>Tertiary Deposits</u>

Early Tertiary deposits exposed at the surface in the project area consist chiefly of rocks that accumulated in terrestrial and lake environments that dominated the Washakie Basin during the Eocene (Bradley 1964, Love 1970, Roehler 1973, 1987, 1991 a-b, 1992 a-c, 1993, Roehler et al. 1988). These deposits comprise, from oldest to youngest, the Wasatch Formation, Green River Formation, and Washakie Formation. The Green River Formation includes the Godiva Rim and Laney (Hart Cabin, Sand Butte and LaClede beds) Members. Younger Tertiary rocks, those of the

Browns Park Formation (Miocene), occur in the southwestern and southeastern extreme of T13N: R96W, the southern margin of the project area.

Sediments of the Wasatch Formation (Cathedral Bluffs Member) accumulated in upland flood-plain and alluvial fan environments during restriction of Lake Gosuite in late early Eocene time. Overlying deposits of the Green River (Laney Shale Member) accumulated following renewed expansion of the lake. Sediments of the Washakie Formation (Kinney Rim and overlying Adobe Town Members) accumulated flood-plain environments during the final filling of Lake Gosiute in middle Eocene (Bridgerian and early Uintan) with substantial input of volcanic material from the Absaroka's in northwestern Wyoming. Deposits of the Brown's Park accumulated in upland environments during Miocene time.

3.1.1.2 Mineral Resources

Major mineral resources within the project area include petroleum, coal, and potentially coal gas. Petroleum was first discovered in the vicinity of the DFPA in 1948 in the Wamsutter Field where production was encountered in the Almond Formation (Upper Cretaceous). The 1970s saw the discovery of oil and gas in the DFPA in Cretaceous rocks in the Haystack (T14N:R96W), McPherson Springs (T13N:R94W), Triton (T13N:R95W) and Windmill Draw (T15N:R94W) fields. Additional discoveries were made in the 1980s in the Cedar Breaks (T13-14N:R95W), Desert Rose (T14N:R96W), N.T. (T15N:R96W), Dripping Rock (T14N:R94W), Rim Unit (T14N:R95W), and Shallow Creek (T16N:R94W) fields (Table 3-4). Mineral resources also include locatable (i.e. uranium) and salable (i.e. sand and gravel, clinker - locally called "scoria") and leasable minerals, specifically, coal. Coal resources are not currently economically minable, but potential exists for coalbed methane development.

Oil, but primarily gas production, in these fields is derived from upper Cretaceous rocks ranging in depth from slightly more than 9,000 feet to more than 16,000 feet. Producing formations include with increasing age and depth the: (1) Lance Formation, (2) Fox Hills Sandstone, (3) Lewis Shale, and (4) Mesaverde Group, including chiefly the Almond Sandstone. The best producers thus far have been lenticular sandstones in the Lewis and Mesaverde Group (including the Almond Sandstone). These and other Cretaceous rocks in the Washakie Basin have been studied extensively in outcrop and in the subsurface and much of this work has been published (Pyles and Slatt 1999, Reeves et al. 1998, Brynes 1997, Carroll and Bohacs 1997, Cluff and Murphy 1997, Dunn et al. 1997, Martinsen 1997, Martinsen and Olson 1997, Tyler et al. 1997, Garcia and Surdam 1997, Smith and Surdam 1997, Surdam 1997, Surdam et al. 1997, Garcia and Surdam 1995, Hendricks 1996, Garcia et al. 1996, Yin and Surdam 1996, Christiansen 1996, Hendricks 1995, Liu 1994, Martinsen et al. 1995, Tyler et al. 1995, Surdam et al. 1995, Garcia et al. 1993, Mullen and Doelger 1993, McPeek 1981).

Considerable gas reserves may be contained in the deeper parts of the Washakie Basin in tight sands of Cretaceous and early Tertiary age generated from coals and carbonaceous shales in the Fort Union, Lance, and Mesaverde Group and perhaps the Lewis and Cody Shales. At depths greater than 8,000 feet along the basin margin and 10,000 feet in the basin center these rocks are over pressured (McPeek 1981, Surdam et al. 1995) with bottom hole pressure gradients in the 0.83 and 0.86 psi/ft for the Mesaverde at Haystack and Adobe Town, and 0.55 to 0.6 psi/ft range for younger Lance and Fort Union gas pay zones. According to McPeek (1981) there is considerable additional potential for oil and gas reserves in these units deeper in the Washakie Basin because of the abnormally high pressure gradients. These gradients result because the Lewis Shale

Table 3-2. Subsurface Geologic Deposits - Desolation Flats Project Area (Love and Christiansen 1985, Love et al. 1993).

Geologic Deposit		Geologic Age	Environment/Lithology
Fort Union Formation		Paleocene	Terrestrial/paludal, chiefly somber colored sandstones, mudstones, carbonaceous shales and coals
Lance Formation (or equivalent)		Late Cretaceous	Terrestrial/marine, brown and gray sandstone , shale and mudstone, coals, and carbonaceous shales.
Fox Hills Sandstone		Late Cretaceous	Marine/shoreline, light-colored sandstone and gray sandy shale
Lewis Shale		Late Cretaceous	Marine, gray shale containing gray, brown sandstones
Mesaverde Group	Almond Formation	Late Cretaceous	Marine/deltaic/terrestrial, white and brown sandstone, sandy shale, coal, carbonaceous shale
	Ericson Sandstone	Late Cretaceous	Marine/estuarine/nonmarine, white sandstone, lenticular conglomerate
	Rock Springs or Allen Ridge Formation	Late Cretaceous	Marine, white to brown sandstone, shale, mudstone, coal
	Blair or Haystack Mountain Formation	Late Cretaceous	
Baxter, Cody, Mancos, Steele Shales		Late Cretaceous	Marine, gray shale, with numerous bentonites, sandstone
Niobrara Formation		Late Cretaceous	Marine, light-colored limestone, gray limey shale
Frontier Formation		Late Cretaceous	Marine/deltaic, gray sandstone and sandy shale
Mowry Shale		Late Cretaceous	Marine, silver-gray, hard siliceous shale, with abundant fish scales and bentonites
Muddy Sandstone		Early Cretaceous	Marine/deltaic, gray to brown sandstone, conglomeratic
Thermopolis Shale		Early Cretaceous	Marine, black, soft, fissile shale
Cloverly Formation		Early Cretaceous	Terrestrial, variegated mudstone, bentonitic, conglomeratic sandstone
Morrison Formation		Jurassic	Terrestrial, varicolored mudstones, white sandstone, bentonite
Sundance Formation		Jurassic	Marine, green-gray glauconitic sandstone and shale, underlain by red and gray non-glauconitic shale and sandstone

Table 3-2. Continued.

Geologic Deposit	Geologic Age	Environment/Lithology
Nugget Sandstone	Triassic to Jurassic	Eolian, gray to red, massive to cross-bedded sandstone
Chugwater Formation	Triassic	Terrestrial/mud flat, red shale and siltstone, sandstone
Dinwoody Formation/Goose Egg Formation	Permian to Triassic	Marine, gray to olive dolomitic siltstone (Dinwoody); red sandstone and siltstone, gypsum, halite, purple to white dolomite and limestone (Goose Egg)
Phosphoria Formation/Goose Egg Formation	Permian	Marine, dark to light gray, green to black, glauconitic shale and sandstone, phosphatic sandstone and dolomite (Phosphoria)
Tensleep Sandstone	Pennsylvanian	Marine, white to gray sandstone with limestone and dolomite
Amsden Formation	Mississippian to Pennsylvanian	Marine, red and green shale and dolomite, persistent red to brown sandstone at base
Madison Limestone	Mississippian	Marine, glue-gray massive limestone and dolomite
Flathead Sandstone	Cambrian	Marine/shoreline, red, banded, quartzose sandstone
unnamed metamorphic rocks	Precambrian	Igneous/metamorphic, granitic and/or intrusive

Table 3-3. Summary of Surface Geologic Deposits and Paleontologic Resources - Desolation Flats Project Area.

Geologic Deposit	Geologic Age	Type of Deposit/ Environment of Deposition	Fossil Resources	BLM Paleontologic Class	Area Present
Alluvial sediments (including alluvium and colluvium)	Holocene	Unconsolidated silts, sands of valleys and plains. Terrestrial-fluvial.	None	2	Widespread
Terrace deposits	Pleistocene	Gravels, silts and sands that predate current erosional cycle. Terrestrial-fluvial.	None	2	Scattered along modern river and stream drainages
Browns Park Formation	Miocene	White sandy tuff and tuffaceous sandstone and mudstone, basal conglomerate. Terrestrial, fluvial, volcanic.	vertebrates, plants	2	Extreme SW and SE T13N-R96W
Washakie Formation	middle Eocene (Bridgerian to Uintan)	Tuffaceous sandstone and bentonitic mudstone, limestone. Terrestrial-fluvial, flood-plain, accumulated after drying up of Lake Gosiute.	vertebrates, invertebrates, plants, trace fossils	5	Widespread in central Washakie Basin
Green River Formation Laney Shale Member Hart Cabin Bed	middle Eocene	Drab-colored sandstone, siltstone, mudstone. Terrestrial-fluvial, accumulated during drying up of Lake Gosiute	vertebrates, invertebrates	5	East flank and south Washakie Basin
Green River Formation Sand Butte Bed	middle Eocene	Tuffaceous siltstone, and sandstone interbedded with brown oil shale and gray limestone, as well as tuff. Lacustrine.	vertebrates, invertebrates	5	East flank and south Washakie Basin
Green River Formation Laney Shale Member LaClede Bed	middle Eocene	Chiefly oil shale, lesser algal limestone, sandstone, claystone and tuff. Lacustrine, accumulated during renewed expansion of Lake Gosiute.	vertebrates, invertebrates, trace fossils	5	Northeast flank Washakie Basin
Green River Formation unnamed basal tongue (=Godiva Rim Member?)	middle Eocene	Interbedded gray, fine-grained sandstone, brown oil shale, green mudstone, gray-green shale, and gray ostracodal, oolitic, and algal limestone. Lacustrine to fluvial	vertebrates, invertebrates, trace fossils	5	East flank and south Washakie Basin
Wasatch Formation Cathedral Bluffs Member	early Eocene	Varicolored, chiefly red sandstone and mudstone. Terrestrial, fluvial, flood plain, accumulated lateral to Lake Gosiute along basin margin.	vertebrates, plants	5	Northeast flank Washakie Basin

Table 3-4. Oil and Gas Fields in the Desolation Flats Project Area.

Field Name	Location	Year Discovered	Producing Formation-Age	Producing Depth Approx (Ft)	Cumulative Oil/ Gas since 1976	Comments
Cedar Breaks	13-14N-95W	1983	Fox Hills-Cretaceous Almond-Cretaceous	10,524 12,650	12 BO/283,583 MCFG	Producing, last report 9/2000
Desert Rose	14N-96W	1986	Lewis-Cretaceous	13,546	0 BO/68,004 MCFG	Abandoned 1987
Dripping Rock	14N-94W	1984	Lance-Cretaceous Lewis-Cretaceous Almond-Cretaceous	12,580	46,390BO/93,494,737134,465 MCFG	Producing, last report 9/2000
Haystack	14N-96W	1978	Lance-Cretaceous Almond-Cretaceous	16,100	0 B0/115,136 MCFG	Abandoned 1985
McPherson Springs	13N-94W	1979	Lewis-Cretaceous Mesaverde-Cretaceous	10,219 11,680	638 BO/489,047 MCFG	Producing, last report 7/2000
N.T.	15N-96W	1982	Lewis-Cretaceous Mesaverde-Cretaceous	12,908 14,796	0 BO/0 MCFG	Shut-in since 11/82
Rim Unit	14N-95W	1988	Lewis-Cretaceous	13,258	12 B/283,583 MCFG	Producing, last report 7/2000
Shallow Creek	16N-94W	1981	Lance-Cretaceous	9,029	10,811 BO/308,134 MCFG	Abandoned 1996
Triton	13N-95W	1979	Lewis-Cretaceous	13,276	3,077 BO/5,429,973 MCFG	Producing, last report 8/2000
Windmill Draw	15N-94W	1977	Almond-Cretaceous Ericson-Cretaceous		1,987 BO/8000,494 MCFG	Producing, last report 7/2000

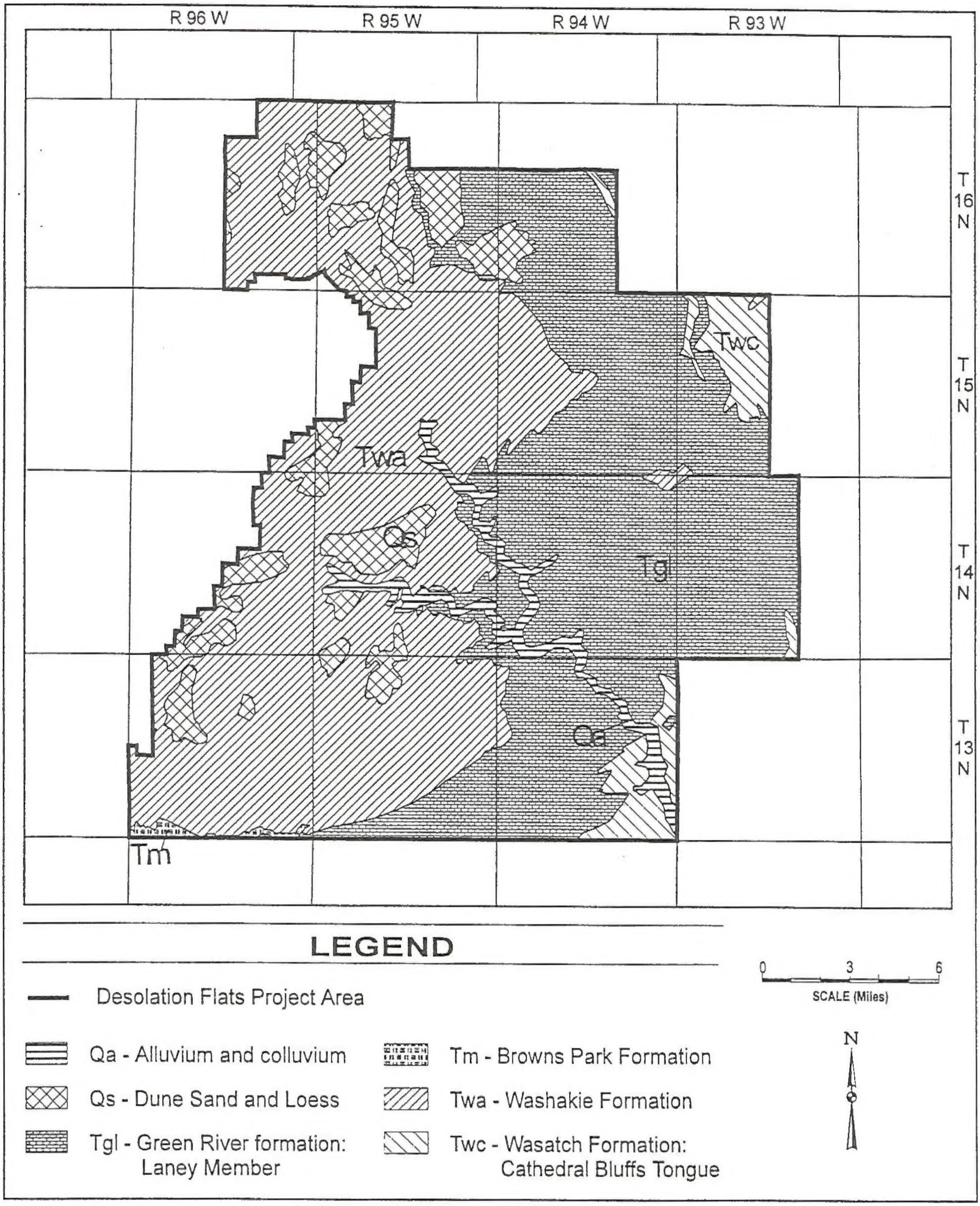


Figure 3-1. Geologic formations within the Desolation Flats Project Area.

apparently acts as a very good seal for gas generated in the Mesaverde as it has a calculated sealing capacity of greater than 5,000 feet of gas in some areas (Surdam et al. 1995).

Deeper parts of the eastern Green River Basin (including the Washakie Basin) remain sparsely explored, but sandstones in the Lewis and Almond formations, as well as younger ones in the overlying Lance and Fort Union formations, might prove to contain large reserves (>20Tcf) of natural gas. Thermal and maturation modeling (Surdam et al. 1995) show that Almond Formation shale and coal in the central parts of the basin had generated significant amounts of liquid hydrocarbons by 40 million years ago and that gas generation from oil to gas reaction had progressed significantly by 30 million years ago. McPeek (1981) estimated 15-17 BCF per well recoverable, whereas Tyler et al. (1995) estimated that between 10 and 50 BCF of gas/mi^2 for Almond Formation and 2 to 8 BCF gas for the Fort Union Formation may underlie the DFPA. Coal resources are not currently economically minable, but the potential exists for coalbed methane development.

The only additional mineral resources documented by the Geological Survey of Wyoming (Harris et al. 1985, Harris and Meyer 1986) include includes construction materials that occur at widely spaced locations in the DFPA. Construction grade wind blown sand deposits occur over large areas of the central Washakie Basin (T13-16N:R96W; T13-14N:R95W; and T16N:R95 W). Alluvial sands and gravels occur in the drainage of Sand Creek in T14-15N:R94-95W and T13N:R94W.

3.1.1.3 Geologic Hazards

Potential geologic hazards include landslides, subsidence, and active or suspected active faults. Landslide potential is greatest in areas where steep slopes occur, particularly where geologic dip on rock formations is steep and parallel to slope or where erosional undercutting may occur. A few landslides have been mapped within the DFPA in T14N:R93W (Case et al. 1991), but these are of limited extent. Areas with unstable soils may also be susceptible to slumping, sliding, and soil creep.

No earthquake epicenters have been noted in the area. Several NW-SE trending faults have been mapped in the southern part of the DFPA (T13-14N:R93-96W). These faults, associated with the Cherokee Arch, do not show evidence of Quaternary activity (Glaze 1973, Case et al.1994, www.wrds.uwyo.edu/wrds/wsgs/hazards/quakes/quake).

3.1.2 Paleontology

3.1.2.1 Paleontologic Overview

Paleontologic resources within sedimentary deposits in the project area record the history of animal and plant life in Wyoming during the early part of the Cenozoic Era. The record represented by Cenozoic age deposits spans about 25 million years and includes parts of the Tertiary and Quaternary Periods.

Mapping documents four geologic deposits that are exposed at the surface in the DFPA. These include, from youngest to oldest: (1) unnamed deposits of late Holocene age including unconsolidated eolian sands, playa lake sediments, stream gravels, alluvium, and colluvium; (2) Browns Park Formation of Miocene age; (3) Washakie Formation of middle Eocene age including

the Adobe Town and Kinney Rim members; (4) Green River Formation of middle Eocene age including the Laney and Godiva Rim members; (5) Wasatch Formation of early Eocene age, including the Cathedral Bluffs members.

With the exception of the Holocene deposits that are probably too young to contain fossils, all the listed sedimentary rock units have the potential to produce scientifically significant fossil resources. Recent published reports of the vertebrate paleontology of the Wasatch, Green River, and Washakie formations include reports by McCarroll and Turnbull (1996), McCarroll (1994, 1996a-b), McGee (1993), Townsend and Harrisville (1993), Turnbull (1978, 1993), Burke (1993), and Covert (1993).

3.1.2.2 BLM Paleontology Classes

BLM paleontology classifications are the basis for establishing the paleontologic potential of surface geologic formations and for determining the need for additional consideration of an area. These categories were originally developed by the Paleontology Center of Excellence and the Region 2 (USFS) Paleo Initiative, modified by Dale Hanson (Regional Paleontologist, Wyoming BLM, 2002) and are defined for each formation listed in Table 3-3. They include the following:

Class 1

Igneous and metamorphic geologic units or units representing heavily disturbed preservational environments that are not likely to contain recognizable fossil remains (tuffs are excluded from this category). Fossils of any kind not known to occur except in the rarest of circumstances. Soils are of igneous or metamorphic origin, landslides and glacial deposits. Land managers' concern for paleoresources on Class 1 areas is negligible. Ground-disturbing activities will not require mitigation except in rare circumstances.

Class 2

Sedimentary geologic units that are not likely to contain vertebrate fossils or scientifically important nonvertebrate fossils. Vertebrate fossils known to occur very rarely or not at all. Age greater than Devonian or younger than 10,000 years before present. Soils of deep marine or aeolian origin. Diagenetic alterations are great enough to have destroyed fossils. Land managers' concern for paleoresources on Class 2 areas is low. Ground-disturbing activities are not likely to require mitigation.

Class 3

Fossiliferous sedimentary geologic units contain fossil deposits and vary in importance, abundance and predictable occurrence. Also includes sedimentary units of unknown fossil potential, including geologic units with sporadic known occurrences of vertebrate fossils. The vertebrate fossils and important nonvertebrate fossils known to occur sporadically; predictability of fossil occurrence known to be low. This class poorly studied and/or poorly documented, and potential fossil yield cannot be assigned without ground reconnaissance.

Land managers' concern for paleoresources on Class 3 areas may extend across the entire range of management. Ground-disturbing activities would require sufficient mitigation to determine whether important paleoresources occur in the area of a proposed action. Mitigation beyond initial findings could range from no mitigation being necessary, to full and continuous monitoring of significant localities during the action.

Class 4

Class 4 geologic units are Class 5 units (see below) that have lower risk of human-caused adverse impacts and/or lower risk of natural degradation. Because of substantial soil/vegetative cover, outcrop is not likely to be impacted. In addition, these units have areas of exposed outcrop that are smaller than 2 contiguous acres, and may form cliffs of sufficient height and slope that most deposits are out of reach by normal means or have other characteristics that lower the vulnerability of both known and unidentified fossil sites. Land managers' concerns for paleoresources on Class 4 areas are toward management and away from unregulated access. Proposed ground-disturbing activities would require assessment to determine whether significant paleoresources occur in the area of a proposed action and whether the action would impact the paleoresources. Mitigation beyond initial findings would range from no mitigation to full and continuous monitoring of significant localities during the action. This classification often may not be applied until after on-the-ground assessments are made.

Class 5

These units are highly fossiliferous geologic units that regularly and predictably produce vertebrate fossils and/or scientifically important nonvertebrate fossils. These units are generally at risk of natural degradation and/or human-caused adverse impacts. Vertebrate fossils and/or scientifically important nonvertebrate fossils are known and documented to occur consistently, predictably, and/or abundantly in these units. Units are generally exposed having little or no soil/vegetative cover. Outcrop areas are extensive, and discontinuous areas are larger than 2 contiguous areas. These units erode readily to form badlands. These units are generally contiguous with extensive outcrop or other characteristics that increase the sensitivity of both known and unidentified fossil sites. Land managers' highest concern for paleoresources should focus on Class 5 areas. These areas are likely to be poached. Mitigation of ground disturbing activities is required and may be intense. Areas of special interest and concern should be designated and intensely managed.

3.2 CLIMATE AND AIR QUALITY

3.2.1 Climate

The climatic conditions for the DFPA are classified as a semiarid mid-continental regime. The climate is typified by dry, windy conditions with limited precipitation and long cold winters. The nearest meteorological measurements were recorded at Baggs, Wyoming for the dates September 1979 through July 2000. The Baggs meteorological station is located approximately 14 miles east of the project area at an elevation of 6,239 feet. Due to the wide variation in elevation and topography within the project area, site specific climatic conditions may vary considerably from the conditions recorded at the Baggs station.

The recorded temperatures at the Baggs station are typically cool, with average daily temperatures ranging between 7°F and 34°F in midwinter and 45°F to 83°F during midsummer. Extreme temperatures have ranged from -50°F (January 14, 1984) to 100°F (August 18, 1984).

The annual average total precipitation is slightly greater than 11 inches. Over 68% of the average annual precipitation occurs between May and October. The annual average snowfall totals 40.5 inches, with December and January being the snowiest months at 9.6 and 8.4 inches respectively. Table 3-5 presents the average temperature range, average total precipitation and average total snowfall by month, while figures 3-2 through 3-4 present the average climatic conditions graphically.

Table 3-5. Mean Monthly Temperature Range, Total Precipitation and Snowfall.

Month	Average Temperature Range (°Fahrenheit)	Average Total Precipitation (inches)	Average Total Snowfall (inches)
January	5.1 - 32.9	0.49	8.4
February	8.6 - 36.6	0.45	5.7
March	19.9 - 47.3	0.44	5.2
April	27.4 - 58.3	0.88	2.5
May	34.2 - 67.7	1.64	0.2
June	41.2 - 79.0	0.98	0.0
July	47.6 - 85.6	1.46	0.0
August	46.1 - 83.7	0.97	0.0
September	37.7 - 74.2	1.15	0.0
October	26.8 - 61.0	1.46	2.0
November	16.6 - 43.5	0.71	6.9
December	6.5 - 33.8	0.55	9.6
Annual Average	26.5 - 58.6	11.19	40.5

Source: (High Plains Regional Climate Center, undated)

The project area is subject to strong gusty winds, often accompanied by snow during the winter months, producing blizzard conditions and drifting snow. The nearest comprehensive wind data were collected at the Rawlins, Wyoming airport, approximately 60 miles from the project area. However, hourly wind data for the period December 1994 through November 1995 were collected near Baggs, Wyoming as part of the Mount Zirkel Wilderness Area Visibility Study. The close proximity of the Baggs station to the project area suggests that these data, rather than the more distant Rawlins data, best represent the wind conditions occurring within the project area. Figure 3-5 presents a wind rose generated from the Baggs data for the period December 1, 1994 through November 30, 1995. The wind rose depicts the relative directional frequency of the winds and the speed class. As indicated, the winds are predominately from the south to southwest approximately 37 percent of the time. The annual mean wind speed is 10.4 miles per hour (4.64 meters/second). Note that the meteorological data set used to generate the wind rose was processed with calm wind measurements set to a speed of one meter per hour. Therefore, the wind rose shows essentially no calms.

The direction and strength of the wind directly affects the dispersion and transport of pollutants emitted to the atmosphere. The strong winds typically present within the project area enhance the potential for the mixing and transport of the pollutants. Table 3-6 presents the wind speed frequency distribution while Table 3-7 summarizes the wind direction frequency.

The Proposed Action and alternatives are not expected to have any adverse effect on the local or regional climate. Therefore, climate is not further discussed in this document.

Table 3-6. Wind Speed Frequency Distribution.

Wind Speed (miles per hour)	Percentage of Occurrence
0.0 to 4.0	6.6
4.0 to 7.5	33.2
7.5 to 12.1	29.6
12.1 to 19.0	21.8
19.0 to 24.7	5.8
Greater than 24.7	3.1

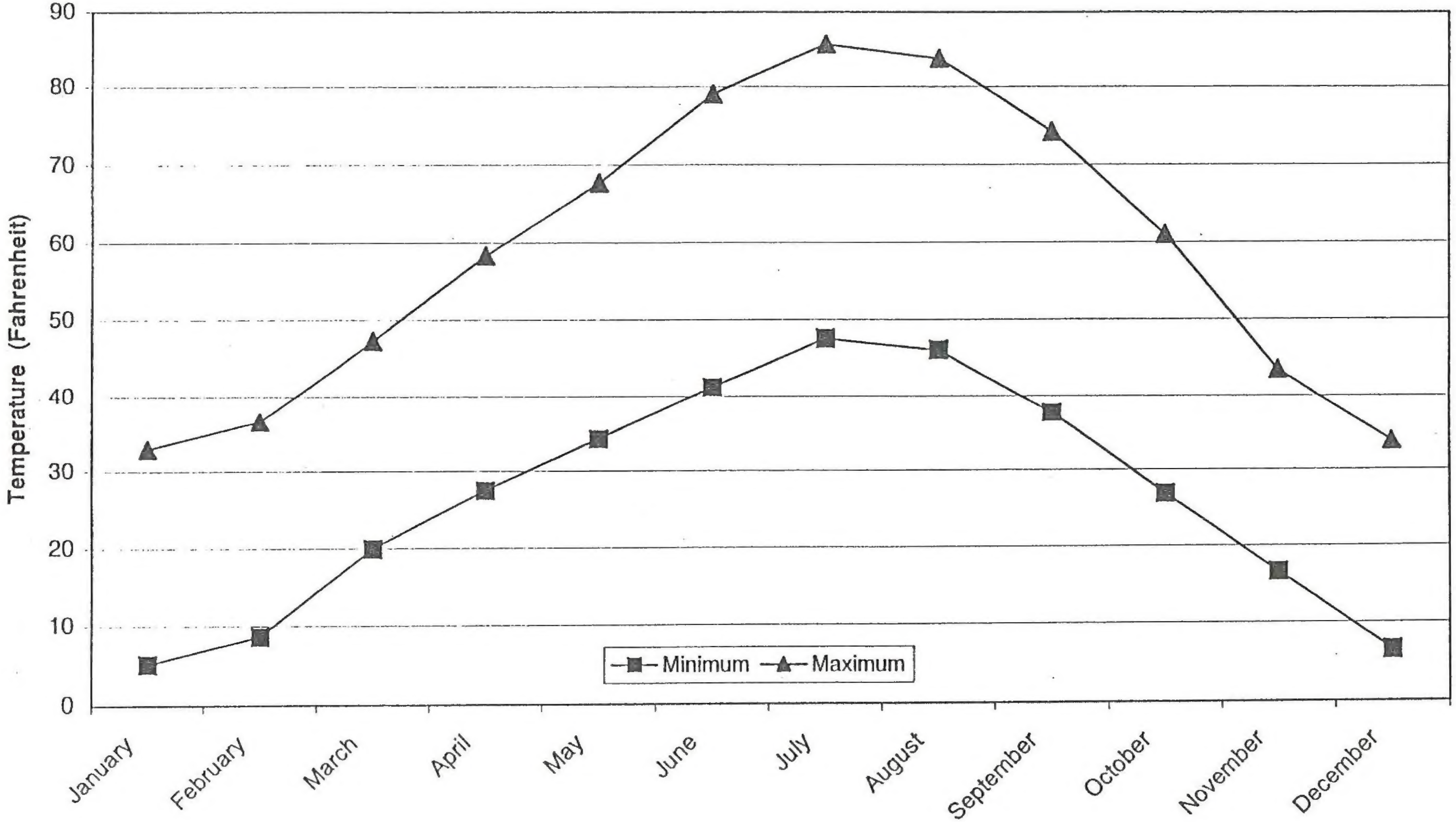


Figure 3-2 Mean Monthly Average Temperature at Baggs, Wyoming (1979 - 2000)

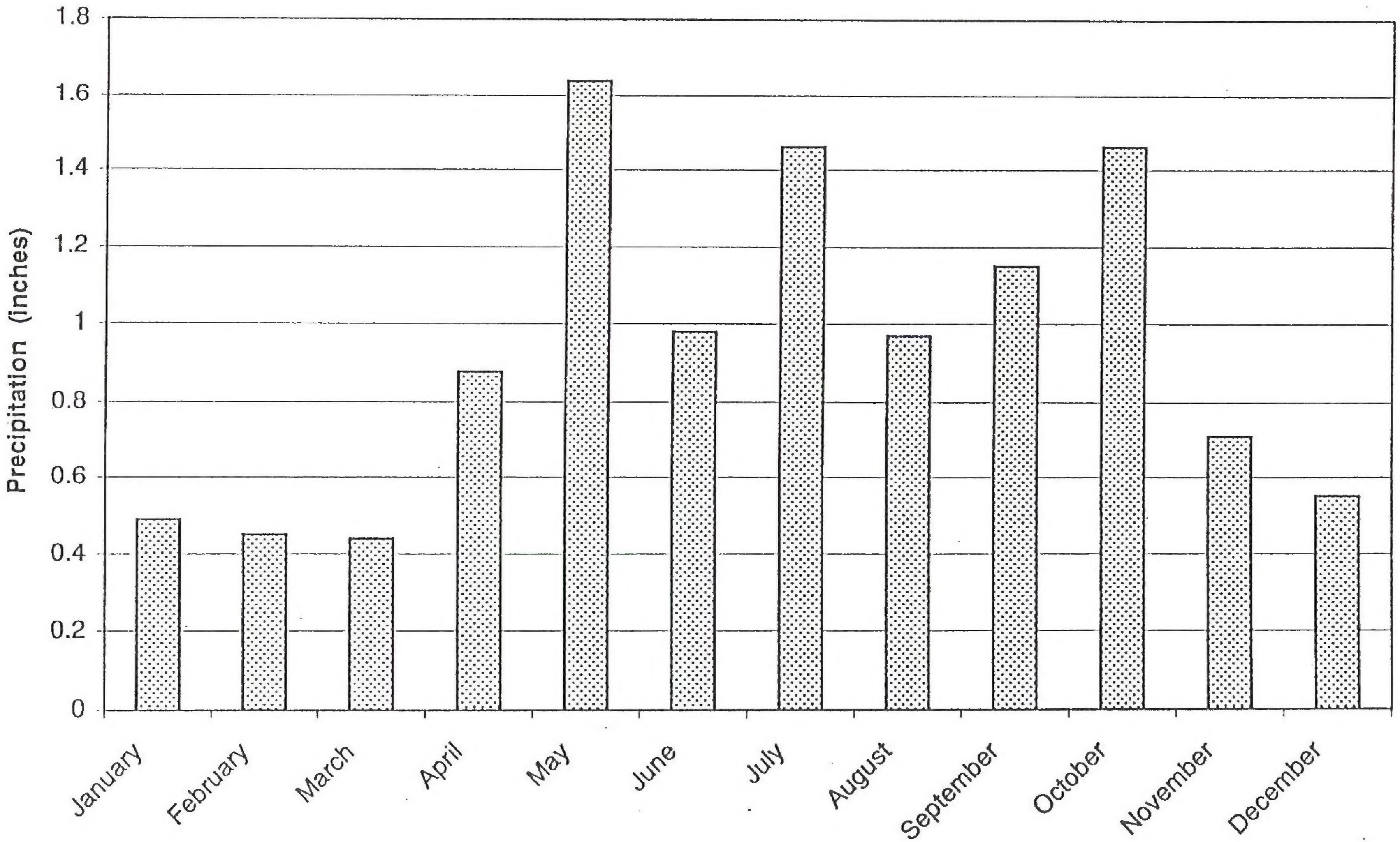


Figure 3-3 Mean Monthly Average Precipitation in Baggs, Wyoming (1979 - 2000)

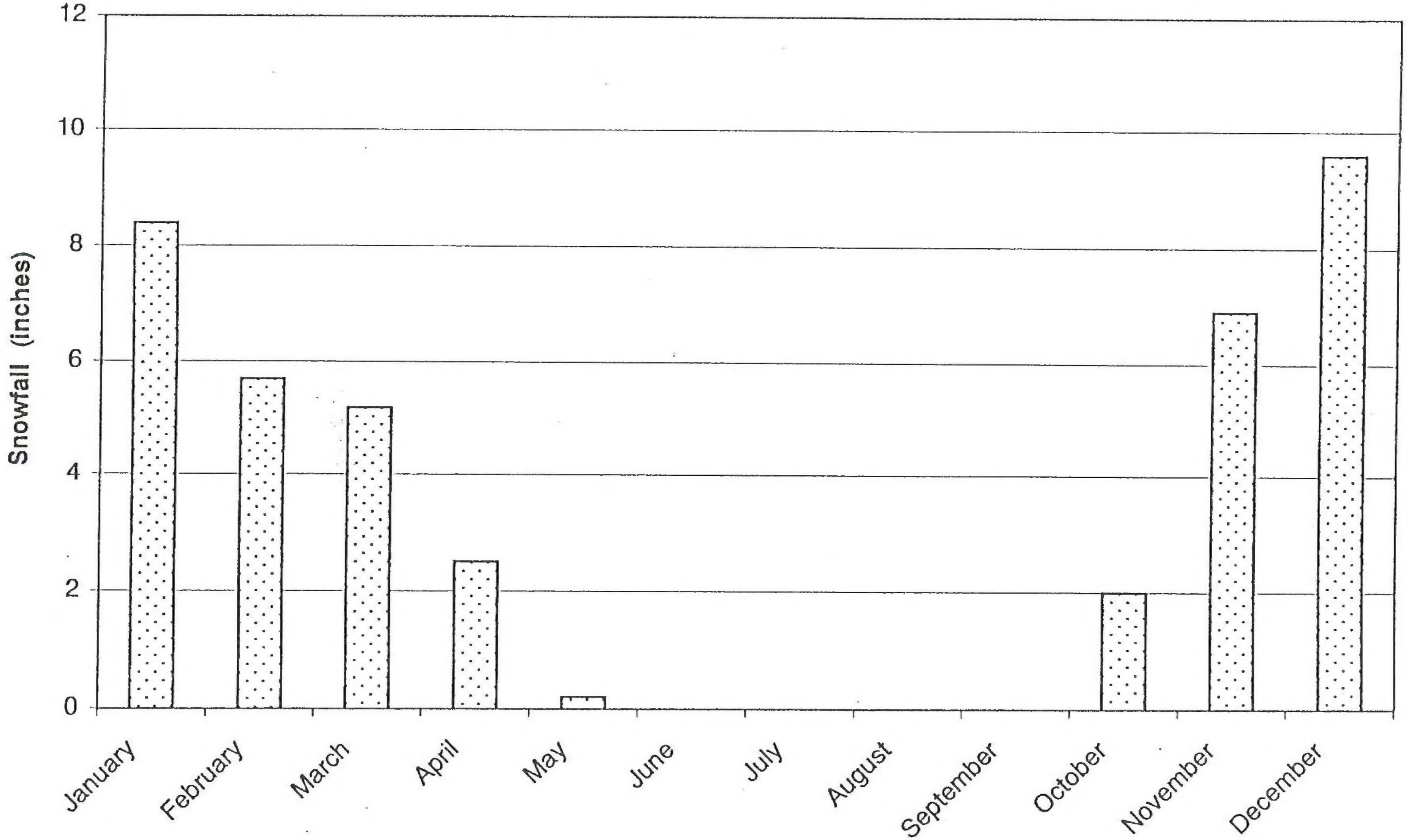
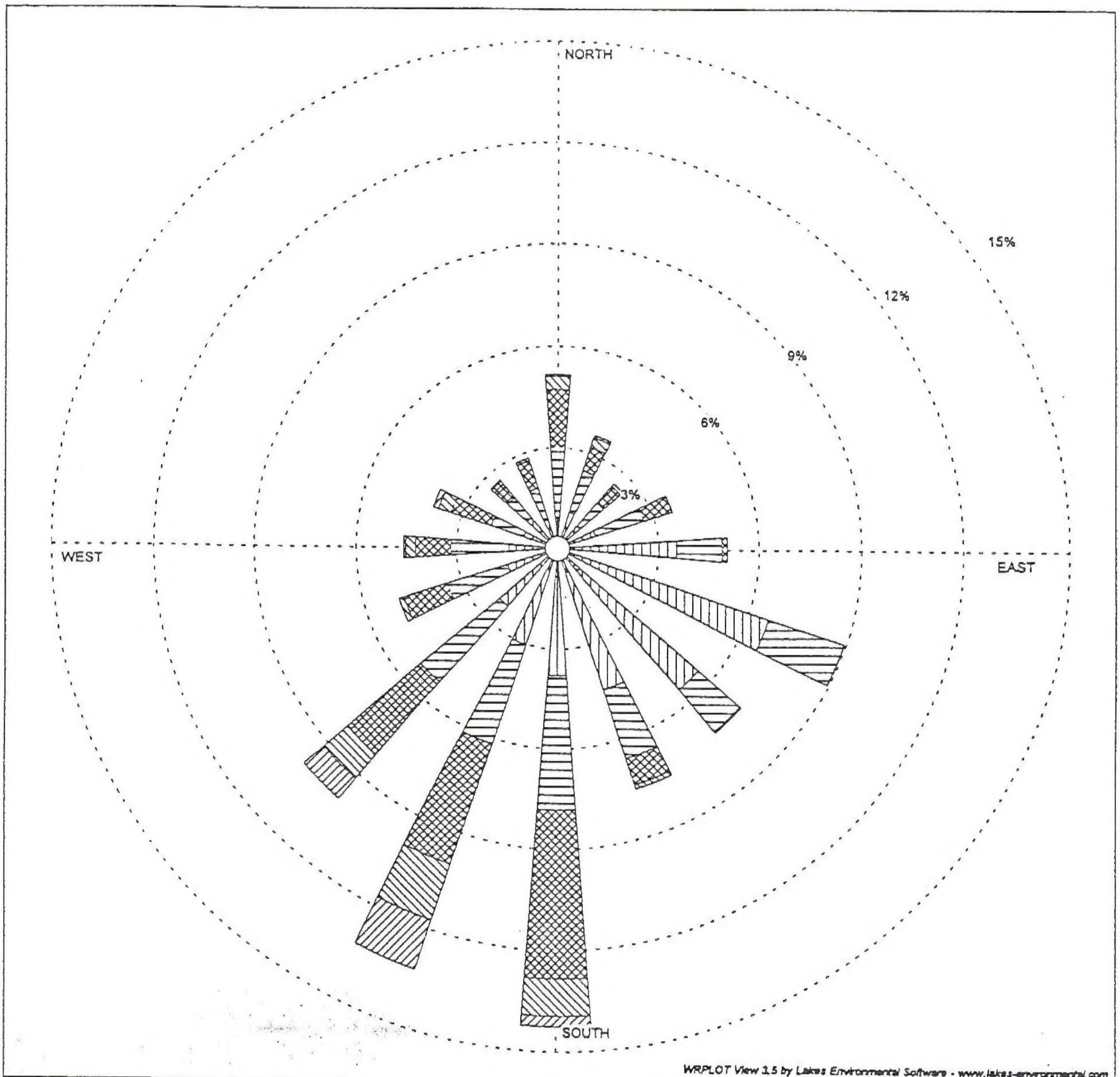


Figure 3-4 Mean Monthly Average Snowfall at Baggs, Wyoming (1979 - 2000)



Wind Speed (m/s)	LOCATION Baggs, Wyoming		PLOT YEAR-DATE-TIME For Dec. 1, 1994 - Nov. 30, 1995
> 11.06 8.49 - 11.06 5.40 - 8.49 3.34 - 5.40 1.80 - 3.34 0.51 - 1.80	DISPLAY Wind Speed	UNIT m/s	COMMENTS Wind direction is the directon from which the wind is blowing. For example, the wind is blowing from the north 5.2% of the time.
	AVG. WIND SPEED 4.64 m/s	CALM WINDS 0.02%	
	ORIENTATION Direction (blowing from)		

Figure 3-5. Wind Rose Generated from Baggs Data for December 1, 1994 through November 30, 1995.

Table 3-7. Wind Direction Frequency.

Direction From Which Wind Is Blowing	Percentage of Occurrence
North	5.2
North Northeast	3.6
Northeast	2.6
East Northeast	3.6
East	5.0
East Southeast	9.0
Southeast	7.2
South Southeast	7.5
South	14.2
South Southwest	13.2
Southwest	10.0
West Southwest	4.9
West	4.5
West Northwest	3.9
Northwest	2.7
North Northwest	2.8

3.2.2 Air Quality

National and state ambient air quality standards set acceptable limits for criteria air pollutant concentrations. Although specific air quality monitoring has not been conducted within the project area, criteria pollutant background concentrations measured in the region are in attainment with the National, Wyoming and Colorado ambient air quality standards, indicating that the local air quality is good. Table 3-8 presents the measured background concentrations and the ambient air quality standards.

Incremental increases in the ambient concentration of criteria pollutants are regulated under the Prevention of Significant Deterioration (PSD) program. The project and the majority of the surrounding region is classified as PSD Class II. However, five PSD Class I areas identified as sensitive receptors exist within the study area: Bridger Wilderness, Fitzpatrick Wilderness, Savage Run Wilderness, Mount Zirkel Wilderness, and Rawah Wilderness. In addition, three PSD Class II sensitive receptor areas were analyzed: Wind River Roadless Area, Popo Agie Wilderness Area and Dinosaur National Monument. As shown in Table 3-8, the limitations on the incremental increases in pollutant concentrations are very restrictive for PSD Class I areas as compared to Class II areas. Figure 3-6 presents a map of the air quality study area and indicates the location of the DFPA and the identified sensitive PSD Class I and Class II areas.

Table 3-8. Background Concentrations and Ambient Air Quality Standards (µg/m³).

Pollutant and Averaging Time	Background Concentration	Wyoming Ambient Air Quality Standards	Colorado Ambient Air Quality Standards	National Ambient Air Quality Standards	PSD Class I Increment	PSD Class II Increment
Carbon Monoxide (CO)						
CO 1-hr	2,299 [a]	40,000	40,000	40,000	None	None
CO 8-hr	1,148 [a]	10,000	10,000	10,000	None	None
Nitrogen Dioxide (NO_2)						
NO_2 Annual	10 [b]	100	100	100	2.5	25
Ozone (O_3)						
O_3 1-hr	144 [d]	None	None	235	None	None
O_3 8-hr	139 [d]	157	157	157	None	None
Particulate Matter less than 10 microns (PM_{10})						
PM_{10} 24-hr	20 [c]	150	150	150	8	30
PM_{10} Annual	12 [c]	50	50	50	4	17
Particulate Matter less than 2.5 microns ($PM_{2.5}$)						
$PM_{2.5}$ 24-hr	10 [e]	None	None	65	None	None
$PM_{2.5}$ Annual	6 [e]	None	None	15	None	None
Sulfur Dioxide (SO_2)						
SO_2 3-hr	29 [f]	1,300	700	1,300	25	512
SO_2 24-hr	18 [f]	260	365	365	5	91
SO_2 Annual	5 [f]	60	80	80	2	20

Note: Effective February 27, 2001 the U.S. Supreme Court upheld the EPA's position on the proposed national 8-hr ozone and PM2.5 standards. Implementation of these standards is pending.

The ozone 1-hour background concentration represents the 90th percentile of the annual maximum daily 1-hour concentrations for the months April through August.

The 8-hour ozone background concentration represents the average annual 4th highest daily maximum 8-hour average.

Other short-term background concentrations represent the second highest measured value.

Sources:

a. CDPHE, 1996 - Data collected at Rifle and Mack, Colorado in conjunction with proposed oil shale development during early 1980s.
b. BLM 1996b - To supplement monitored NO_2 data, a separate NO_2 modeling analysis was performed which included many NO_x emission sources.
c. WDEQ, 1997 data collected for the Carbon County UCG Project, data collected 9 miles west of Rawlins, WY, June 1994-November, 1994
d. Clean Air Status and Trends Network, n.d. - Data collected at Pinedale, Wyoming (1997 - 1999).
e. Background $PM_{2.5}$ concentrations estimated at one-half of PM_{10} values based upon EPA literature.
f. CDPHE-APCD, 1996 - Data collected at the Craig Power Plant site and at Colorado Oil Shale areas from 1980 to 1984.

It should be noted that any comparisons made to the PSD Class I and II increments during this analysis are intended to evaluate an "impact threshold" and do not represent a regulatory PSD increment consumption analysis. The determination of PSD increment consumption is a state air quality regulatory agency responsibility with oversight from the Environmental Protection Agency (EPA). A PSD increment consumption analysis is part of the major New Source Review process and may also be performed by a state regulatory agency or EPA in order to determine minor source increment consumption.

In addition to ambient air quality standards and PSD increments, Air Quality Related Values (AQRV's), which include the potential air pollution effects on visibility and the acidification of surface water bodies, is a concern for the sensitive PSD Class I and Class II receptors. Visibility is often referred to in terms of atmospheric light extinction or visual range, that is the furthest distance a person can see a landscape feature. Visibility also involves how well scenic landscapes can be seen and appreciated. When visibility is impaired by air pollution, people perceive a loss of color, contrast and detail.

Visibility impairment is expressed in terms of deciview (dv). The deciview index was developed as a linear perceived visual change. A change in visibility of 1.0 dv represents a "just noticeable change" by the average person under most circumstances. Increasing deciview values represent proportionately larger perceived visibility impairments. The Forest Service (FS) has identified specific "Level of Acceptable Change" (LAC) values which they use to evaluate potential air quality impacts within their wilderness areas (USDA-FS 1993). For visibility impacts, the FS utilizes a LAC of 0.5 deciview, or "one-half of a just noticeable change."

Continuous visibility related background data collected as part of the Interagency Monitoring of PROtected Visual Environments (IMPROVE) program are available for two sensitive receptors within the study area: Bridger Wilderness and Mt. Zirkel. The Bridger data best represent existing conditions at the Bridger, Fitzpatrick, and Popo Agie wilderness areas and the Wind River Roadless Area, while the Mt. Zirkel data best represent existing conditions for Dinosaur National Monument and the Mt. Zirkel, Savage Run, and Rawah wilderness areas.

Table 3-9 summarizes the seasonal visibility conditions recorded at Bridger Wilderness. As shown, visibility in the region is very good, with an annual average visual range of 175 miles. Figure 3-7 presents a five year rolling average of the 20% cleanest, 20% haziest and the mid-range 40% to 60% visibility conditions monitored at Bridger Wilderness between 1988 and 1999 (IMPROVE 2001). As shown, monitored visibility conditions at Bridger Wilderness have been stable over the period. Visibility conditions for Mt. Zirkel are similar to Bridger Wilderness.

Acid deposition and the acidification of surface water bodies is a concern for sensitive lakes located within wilderness areas. Atmospheric acid deposition is monitored as part of the National Acid Deposition Program / National Trends Network near Pinedale, Wyoming. Although the monitored deposition values are well below those considered to damage vegetation (USDI-BLM 1996b), even low levels of acid deposition may exceed the acid neutralizing capacity (ANC) of sensitive high mountain lakes (USDI-BLM 1996b). Baseline ANC levels for monitored mountain lakes within the study area are provided in Table 3-10.

To evaluate potential acid deposition impacts, the FS utilizes an LAC of no greater than 1 microequivalent/liter (μeq/l) change in ANC for sensitive water bodies with existing ANC levels less than 25 μeq/l. A 10 percent change in ANC is considered significant for lakes with existing ANC levels over 25 μeq/l.

Table 3-9. Baseline Standard Visual Range for the Bridger Wilderness Area.

Season	Standard Visual Range (kilometers)	Deciview (Unitless)
Annual	175	8.1
Spring	165	8.6
Summer	162	8.8
Autumn	169	8.4
Winter	218	5.9

Note: Data is aggregated over the three year period between March 1996 and February 1999 (IMPROVE 2000).

Table 3-10. Background Acid Neutralizing Capacity (ANC) for Monitored Lakes.

Wilderness Area	Water Body	Background ANC (µeq/l)
Bridger	Black Joe Lake	69.0 [a]
	Deep Lake	61.0 [a]
	Hobbs Lake	68.0 [a]
	Upper Frozen Lake	5.7 [b]
Fitzpatrick	Ross Lake	61.4 [a]
Popo Agie	Lower Saddlebag Lake	55.5 [a]
Mount Zirkel	Pothole A-8	16.0 [d]
	Seven Lakes	35.5 [d]
	Upper Slide Lake	24.7 [d]
Medicine Bow	West Glacier	26.1 [c]
Rawah	Island Lake	64.6 [a]
	Rawah #4 Lake	41.2 [a]

Note: The basis for ANC data is the 10^{th} percentile of measurements at the lake outlet when greater than 5 years of data exist. When 5 or less years of data are available, average values are used.

Sources:
a. D. Haddow, USDA-FS, 2001.
b. T. Svalberg, USDA-FS, 2000.
c. R. Musselman, USDA-FS, 2001.
d. A. Mast, USGS, 2001.

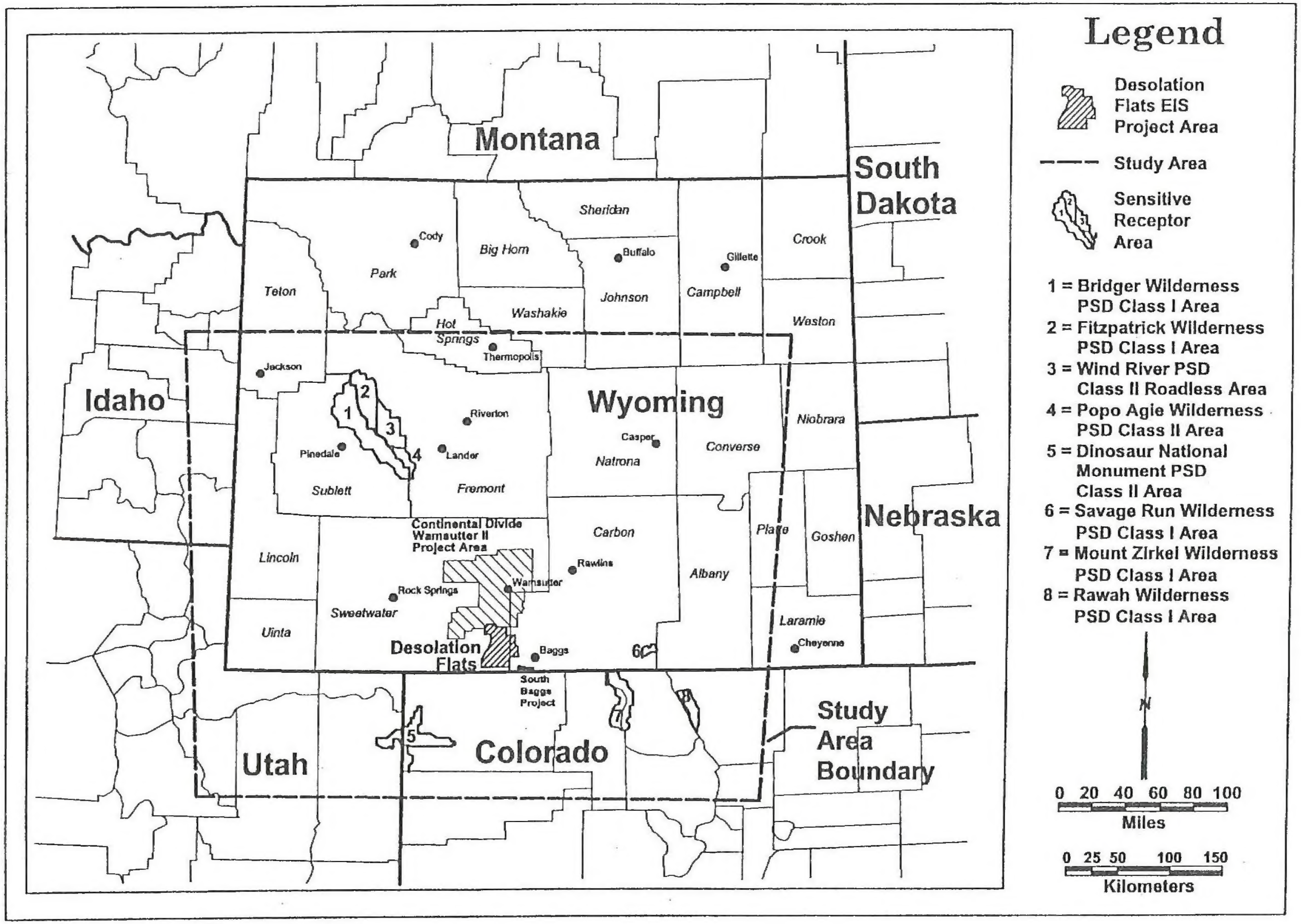


Figure 3-6. Air Quality Impact Assessment Area

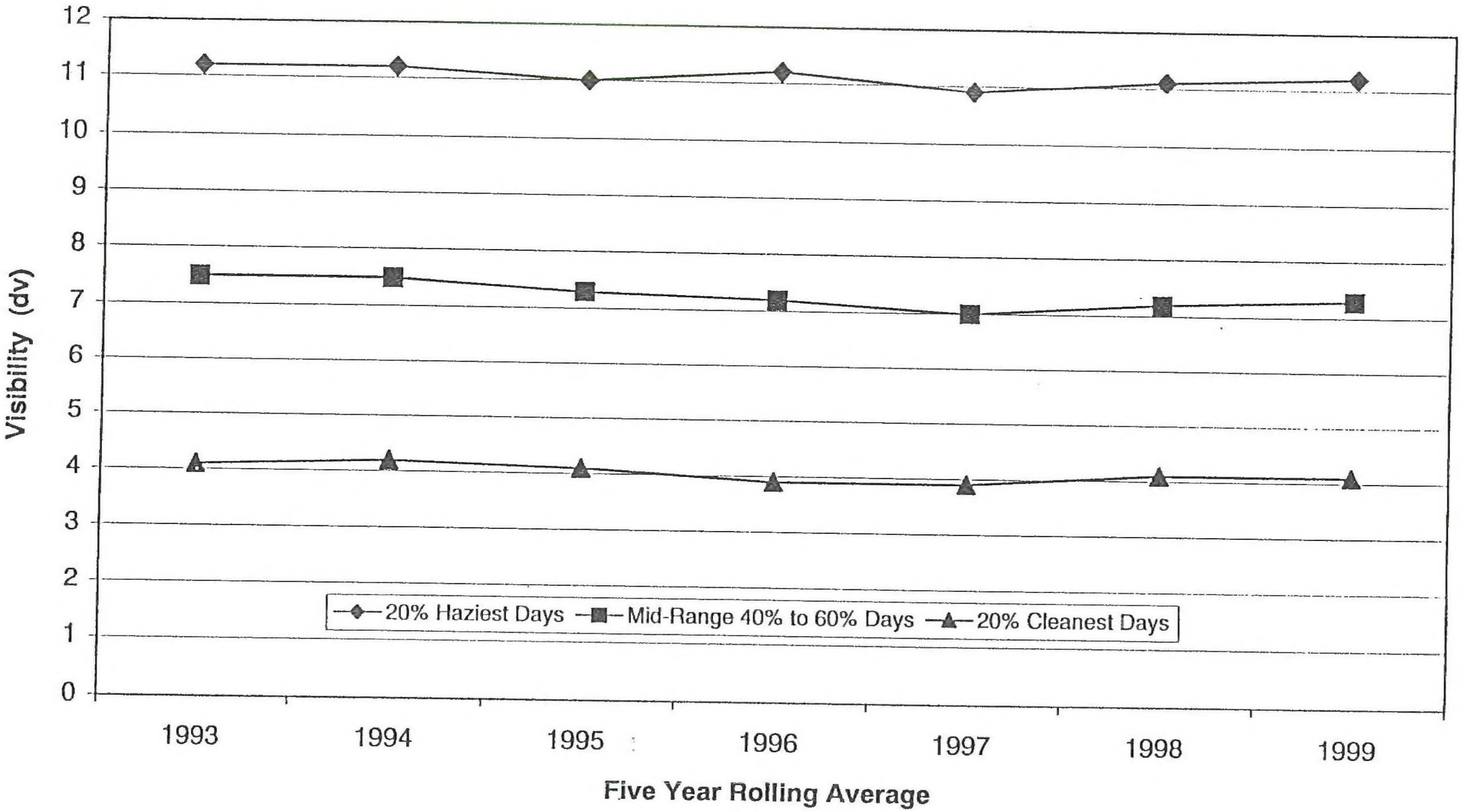


Figure 3-7 Visibility in Bridger Wilderness

3.3 SOILS

3.3.1 Topography

The range of topography within the DFPA is quite variable. There are nearly level to gently sloping floodplains and alluvial terraces; alluvial fans as well as moderately sloping terraces; and rolling, undulating residual upland hills and terraces. These are broken by steep escarpments and badlands. Maximum elevation is approximately 2,300 meters and occurs near the southern project boundary on Powder Rim. Minimum elevation is approximately 1,880 meters occurring in the extreme southeastern corner of the project area near the confluence of Sand Creek with the Little Snake River.

3.3.2 Soils

Soils within the project area are distributed according to primary differences in parent material (both residual and depositional), elevation, moisture, and topographic slope and position. Baseline soils information was extracted from two existing BLM soil surveys (USDI-BLM 1981).

In addition, field investigation was utilized to gather site-specific information on soil characteristics, verify existing information, assess existing soil disturbance, and develop field-wide reclamation recommendations. Approximately 13 percent of the project area does not have information available through the soil surveys mentioned earlier.

3.3.2.1 General Soil Characteristics

The DFPA is considered part of the Washakie Basin. Upper Eocene and Quaternary make up the majority of the major geologic units in the area and have a distinct impact on the subsequent development of the soils and their distribution. The dominant Upper Eocene formation is the Washakie Formation and its associated Adobe Town Member. Textures in this member are various and range from sandstone, siltstone, mudstone, silty limestone, silty dolomite, tuff and conglomerate. Upper Tertiary formations are located on the southern end of the project area at Powder Rim and primarily include the Browns Park Formation; textures vary from sandstone, siltstone and mudstone. Lower Eocene formations are located on the eastern border of the project area. The dominant formation is the Green River Formation (Hartt Cabin Bed of Laney Member); textures vary from sandstone, siltstone, mudstone, oil shale, limestone, and dolomite. Pockets of Quaternary sands are scattered throughout the central portion of the project area; resulting soils are distinctly sandy and almost appear dune-like.

Soils are primarily included in the Torriorthents-Camborthids-Haplargids association with areas along the Little Snake River in the Torrifluvents-Fluvaquents-Haplaquepts association. Such soils formed under a dry, cool (frigid) climate with spring moisture. Soils of this association have low organic matter and are formed from residuum on Tertiary bedrock-controlled uplands and in Quaternary alluvium and colluvium along stream and river courses. Residual soils formed from the many types of bedrock exposed at the surface, as well as from wind and flowing water deposits. Principle parent materials of soils in the project area are shales, siltstones, sandstones, and alluvium.

Two "Order 3" soil surveys have been completed for the project area, one by Texas Resource Consultants and one by Soil and Land Use Technology, Inc. Much of the information utilized for this project was derived from the second survey mentioned above. 108 soil map units have been

delineated within the project area by the BLM (USDI-BLM 1981). The series contained within these map units are included in the twenty soil taxonomic classes listed in Table 3-11 (USDA-NRCS 2000):

Table 3-11. Soil Taxonomic Classes.

Taxonomic Class	Number of Soil Series in Project Area
Aquandic Endoaquoll	1
Aquic Hapludult	1
Aridic Calciustept	1
Leptic Haplogypsid	1
Lithic Calciustept	1
Pachic Haploxeroll	1
Leptic Torrertic Natrustalf	1
Typic Fluvaquent	1
Typic Haplocalcid	1
Typic Natriargid	4
Typic Torrifluvent	2
Typic Torriorthent	7
Typic Torripsamment	2
Ustertic Haplocambid	1
Ustic Calciargid	3
Ustic Haplargid	5
Ustic Haplocalcid	6
Ustic Haplocambid	1
Ustic Natriargid	3
Ustic Torriorthent	5
TOTAL	48

Of the 233,542 acres of land within the project area, most (154,104.2 acres or 66 percent) are considered sensitive for topsoil or roads or are susceptible to runoff, wind erosion, or water erosion. The balance (79,437.8 acres or 34 percent) are non-sensitive soils. Table 3-12 provides an approximate breakdown of sensitivity by category, nature of sensitivity, and area.

Soil Texture and Slope. A large portion of the soils in the DFPA was derived from shales, which produce medium- to fine-textured soils. Soil textures primarily consist of variations of loam (e.g., sandy loam, loam, clay loam, silt loam, silty clay loam, channery loam, etc.) and occur on all topographic positions. Heavier soils (e.g., silty clay or clay textures) occur in alkali bottomlands and badland breaks and slopes. Stratified sands and gravels are present in riverwash associated with streambeds and floodplains, and numerous stabilized sand dunes occur in hilly upland areas. Badlands and rock outcrops are formed from shale and sandstone and have little or no soil development due to their predominant erosive feature. Slopes within the project area are generally level to undulating (0 to 10 percent) and broken by areas of steeper slopes (10 to 40 percent). Nine textural families are represented on the project area and include: fine (smectitic); fine-loamy; loamy; clayey; loamy skeletal; coarse-loamy; fine-silty; mixed; and sandy. Fine-loamy, loamy, and coarse-loamy are the major textural families.

Table 3-12. Area of Sensitive and Non-Sensitive Soils within the DFPA.[1]

Category	Nature of Sensitivity	Acres[2]	Percent of Total Area[2]
Sensitive			
Topsoil	Poor suitability: too clayey, too sandy, excess salt/sodium, small stones, slope, and/or wetness/flooding	104,441.1	44.7
Roads	Severe limitations: low strength, slope, depth to rock, too sandy, and/or wetness	54,810.3	23.5
Surface Water Erosion	High (Rapid or very rapid)	26,380.9	11.3
Wind Erosion	High-Very High, High (Severe to High)	34,834.2	14.9
Runoff (based on Hydrologic Groups)	Severe (Hydrologic Group D)	66,713.4	28.6
Unavailable	Unavailable	31,131.1	13.3
Cumulative Category		**Acres**	**Percent Total**
Sensitive		154,104.2	66
Non-Sensitive		79,437.8	34
TOTAL		**233,542.0**	**100**

[1] Source: BLM soil map unit descriptions.
[2] Acres overlap for different sensitivity categories; therefore, they do not total the DFPA of 233,542 acres. Likewise, the percent of total area does not equal 100 due to overlap.

Soil Depth. Soils are deep (>40 inches) on alluvial fans, basins, and valley alluvium. Shallow soils (<20 inches) occur on plains and ravines underlain by sandstone, siltstone, and shale bedrock as well as in areas with steeper topography. Moderately deep soils are those considered between 20 and 40 inches; these soils generally lie on residual upland plains and relatively gentle sideslopes.

The effective rooting depth approximates the total soil depth or is slightly shallower. The depth to bedrock, however, presents some limitations in the suitability of soil map units for placement of roads or reclamation.

Soil Permeability. The majority of the soils within the area have moderate permeability. Areas with sandy soil textures, however, have moderately rapid to rapid permeability. Soils with heavier textures have moderately slow to slow permeability. If compacted, soils become less permeable.

Soil crusting also reduces infiltration rates. Most soils in the project area are likely to form a surface crust, particularly if vegetative cover deteriorates.

Bedrock underlying the soils is often fractured, which makes it highly permeable. Soils with a high clay content are subject to cracking upon wetting and drying; tubular cavities can develop as water flows through these cracks. Soils adjacent to major drainages tend to be stratified with repeating layers of finer and coarser soil material which allows for differential lateral flow within these layers.

Soil Productivity and Salinity. Soil productivity is naturally low for a portion of the project area due to high clay content, excess sand content, shallow depth, and/or salt content; most of the project area has an intermediate productivity baseline. Soils typically have adequate potassium for plant growth, while nitrogen and phosphorus may be limiting. Precipitation is the chief controlling factor of productivity. Lower precipitation produces less vegetative cover and, consequently, less organic matter for the soil. Soil crusting affects soil productivity by reducing infiltration rates. Salinity would affect osmotic potential in soils and eventual water uptake by plant roots, which would make whatever precipitation that is available less effective.

Available Water Capacity. Shallow soils have a lower water-holding capacity than deeper soils due to lack of depth and ultimate volume. From a physical standpoint, medium-textured soils have a higher available water capacity than heavy soils or coarse textured soils. The average available water capacity for the soils in the project area is low to moderate.

Seasonal High Water Table. In general, the water table within the project area is greater than six feet below the soil surface. Floodplains, alluvial terraces, seep areas, streambeds, and bottomlands have an average water table depth less than six feet. Flooding is rare, typically brief, and generally associated with spring runoff and summer storm events. Wetness and/or flooding affects the suitability of soils for use as topsoil and roads in portions of the project area near major drainages, including the confluence of Sand Creek with the Little Snake River in the southeast portion of the project area.

Erosion. Soil erodibility due to water and wind varies with soil texture. Silts and silt loams are most susceptible to water erosion. In contrast, fine sands, loamy sands, and coarse sandy loams are most susceptible to wind erosion. Water erosion primarily occurs during spring snowmelt and summer thunderstorms that cause intensive runoff and flash flooding. Many streams in the area have deep, incised channels. These channels continually erode as channel banks cave in and through upstream gully migration. Upland erosion simultaneously occurs due to sheet and rill erosion. The sparse vegetative cover exposes more soil to raindrop impact. Within the DFPA, soil susceptibility to water erosion is generally moderate in the surface topsoil horizon and moderate to severe in the subsoil horizons due to low permeability or non-cohesive soils, as well as steep slopes. However, the central portion of the project area has overall slight water erosion susceptibility in the Quaternary sands. Runoff potential is highly variable ranging from low to high, but with a central tendency of moderate to high. Overall wind erosion potential is moderate, but ranges from slight to severe.

Most areas are undergoing moderate natural rates of erosion. Accelerated erosion occurs in localized areas. The highest rate of natural, geologic erosion from water occurs in areas with naturally low vegetative cover, soil crusting, low organic matter content, and soft shales. In areas high in sodium where clays have dispersed, overall soil particles are more easily detached by wind and water. Scattered areas of sand dunes are easily eroded by wind when vegetation is removed. Areas with greater amounts of vegetative cover and organic matter content and/or lower sodium

content have a lower natural rate of erosion by water. In addition, areas with harder rock fragments associated on or near the surface have less erosion from either water or wind. Areas with unstable soils on the surface or at depth are susceptible to slumping, sliding, and soil creep. Across the DFPA, natural re-vegetation and stabilization will occur, in time, if eroded sediment is retained and allowed to vegetate.

Soil Strength. Soils throughout the area have low strength upon wetting; deformation under a load is a problem. Compaction may be a possible tool to increase strength and to keep deformation under a load to a minimum. As Table 3-12 indicates, low soil strength presents severe limitations for placement of roads on nearly one quarter of the project area.

Reclamation Potential. Salinity, alkalinity, steep slopes, high clay content, sandy soils, small stones, wetness/flooding (i.e., prolonged saturation due to a high water table and/or surface flooding), shallow soils, and low precipitation are all factors that have potential to limit reclamation success. These factors affect the ability to effectively use heavy equipment in reclaiming a disturbed area, the species selected for revegetation, and/or reclamation techniques employed (e.g., mulching, scarification, etc.). Reclamation techniques on surface-disturbed areas are critical for providing adequate nutrients to allow for successful revegetation.

Reclamation potential is generally poor to moderate within the DFPA, with some limited areas of good potential. Potential or general suitability were determined from existing BLM soils mapping and field verification. No samples were gathered for laboratory analyses. In general, surface textures were loam, sandy loam, clay loam, silt loam, silty clay loam, and channery loam. Soils on saline flats and badlands had salt and sodium levels that would affect reclamation potential. In such soils, special measures are typically needed to reduce sodium levels and achieve adequate revegetation. Due to low organic matter in the soil and lack of geologic material that would enhance fertility, all soils are assumed to be deficient in nitrogen. Potassium is assumed to be adequate. Based on actual field sampling in the adjacent South Baggs surveyed area, phosphorus is likely limiting, as well, and that most pH's, with the exception of areas high in sodium, are from 7.4 to 8.4, which is considered mildly to moderately alkaline. The presence of lime was predominantly adequate/normal.

Selenium Content. Historical site specific locations of selenium rich soils are present, but cover small areas within this landtype. The Wyoming State Geological Survey (WSGS 2000) referred to a 1959 University of Wyoming bulletin by O.A. Beath that indicated selenium concentrations as high as 112 ppm have been historically documented in the Poison Basin near Baggs (T12N: R93W). Beath (1959) indicated selenium in this general portion of Wyoming ranging from .32 to 3.1% but it is not clear how this value would translate to ppm in the soil; much of this earlier work was in conjunction with uranium exploration. It is possible that exposed bedrock and residual soils, especially derived from the Browns Park Formation of the Miocene age, could be potential sources of selenium in the project area (Case and Cannia 1988).

3.3.2.2 Site-Specific Soil Characterization

Site-specific field investigation into the character of soils in the project area was accomplished in October 2000. As indicated previously, existing soil information was verified in the field but no samples were collected for laboratory analysis throughout the project area. Soil characteristics such as texture, structure, horizonation, color, permeability, and drainage were recorded at each soil verification point, as well as an inventory of major plant species. Four relatively homogeneous soil landtypes were identified during this sampling and include the following: (1) residual slopes and

flats, (2) ridgelines, (3) alluvial bottomlands, and (4) badland breaks, and are described subsequently.

Residual Slopes and Flats

This landtype covers the largest portion of the project area, 81.1 percent or 189,403 acres. This landtype correlates with the primary vegetatal cover types of mixed grass prairie, Wyoming big sagebrush, and saltbush and with the secondary cover type of greasewood, as described in the Vegetation Section. Slope gradients range from flat to moderately sloping (0 to 40 percent) with some areas on steeper slopes (40 to 80 percent). Soils in this landtype are generally moderately deep to deep over a shale or sandstone parent material. Dominant soil texture ranges from sandy loam and silty fine sand at the surface, to silty medium sand, to silty coarse sand and sandy clay loam at depth.

Soil colors are typically dark brown and dark yellowish brown at the surface and yellowish brown to light olive brown below. Soil permeability is generally moderate to moderately rapid, runoff potential moderate to moderately high, and wind and water erosion potential moderately high and moderate, respectively. The soils are well drained and do not have a water table within 6 feet of the soil surface. Soil pH is neutral to slightly basic and the soils have relatively low natural fertility levels in terms of phosphorus, potassium, and nitrate nitrogen. Sodium contents are generally low; however, in some areas with predominantly clay texture, poor drainage, and heavy clay parent materials, sodium content may be high. Most of the soil within this landtype has a fair to good reclamation potential with coarse fragment content (gravel and sand), high erodibility, droughtiness, and shallow topsoil depths providing the greatest impediment to reclamation success.

Badlands

This landtype covers the second largest portion of the project area, 11.4 percent or 26,624 acres. This landtype correlates with the desert shrub and basin exposed rock/soil primary vegetal cover types described in the Vegetation Section. There is a general lack of either woody or herbaceous plant growth associated with these soils. Slope gradients range from flat to moderately sloping to strongly sloping (20 to 100 percent). Soils in this landtype are very shallow over a shale parent material. Dominant soil texture ranges from silty clay to clay. Soil colors are typically vivid and range from reddish brown to strong brown to olive gray. Soil permeability is very slow, runoff potential very high, and wind and water erosion potential low and moderate, respectively. The soils are moderately-well drained and do not have a water table within 6 feet of the soil surface. Soil pH is slightly basic and the soils have very low natural fertility levels in terms of phosphorus, potassium, and nitrate nitrogen. Sodium contents are generally high. Soils within this landtype have a very poor reclamation potential with high clay content, droughtiness, and shallow topsoil depths providing the greatest impediment to reclamation success.

Ridgelines

This landtype covers the third largest portion of the project area, 6.7 percent or 15,647 acres. This landtype correlates with the juniper woodland primary vegetal cover type described in the Vegetation Section. Slope gradients range from flat to slightly sloping (0 to 10 percent). Soils in this landtype are generally shallow over a shale or sandstone parent material. Dominant soil texture ranges from fine sandy loam to silty clay loam at the surface to sandy clay at depth. Soil colors are typically olive brown at the surface and olive yellow below. Soil permeability is generally slow to moderate, runoff potential moderately high, and wind and water erosion potential moderate

and moderately high, respectively. The soils are moderately-well drained and do not have a water table within 6 feet of the soil surface. Soil pH is slightly basic and the soils have relatively low natural fertility levels in terms of phosphorus, potassium, and nitrate nitrogen. Sodium contents are generally low. Most of the soil within this landtype has a poor to fair reclamation potential with coarse fragment content, clay content, droughtiness, and extreme shallow topsoil depths providing the greatest impediment to reclamation success.

Alluvial Bottomlands

This landtype covers the smallest portion of the project area, 0.8 percent or 1,868 acres. This landtype correlates with the shrub dominated riparian primary vegetal cover types described in the Vegetation Section. Slope gradients are generally flat to slightly sloping (0 to 10 percent). Soils in this landtype are generally deep and were derived from alluvial deposits along streams. Dominant soil texture ranges from fine sandy loam to silty clay loam at the surface to sandy clay loam and sandy clay at depth. Soil colors are typically very dark brown to dark yellowish brown at the surface and dark yellowish brown to light olive brown below. Soil permeability is generally moderate to moderately rapid, runoff potential low to moderate, and wind and water erosion potential low and moderate, respectively. The soils are moderate to moderately-well drained and, depending on location, may have a water table within 6 feet of the soil surface. Soil pH is neutral to slightly basic, and the soils have relatively low natural fertility levels in terms of phosphorus and potassium, but nitrogen levels are generally adequate due to high productivity rates associated with more favorable water relations. Sodium contents are generally low, but may be elevated in areas of clay deposits. Most of the soil within this landtype has fair to good reclamation potential with clay content and saturation providing the greatest impediment to reclamation success. These soils correlate with natural drainage ways and floodways of perennial and intermittent streams, primarily Sand Creek within the project area.

3.3.2.3 Existing Soil Disturbances

Existing disturbance includes: 126.1 mi of primary roads (611.1 ac); 132.9 mi of secondary roads (322.3 ac); 402 mi of 2-track roads (194.5 ac); 82.2 mi pipeline (39.9 ac) and 338.6 acres of other disturbed areas. Therefore, total existing disturbance within the DFPA is 1,506.4 acres, or 0.6% of the total project area. Disturbed land consists of: (1) off-road vehicle tracks created by past livestock management activities and recreationists; (2) mineral exploration activities; (3) developed roads for oil and gas development, as well as actual pads and facilities; and (4) Carbon County Road 700. The total acreage of disturbance has not been broken out by vegetation type; however, most of this disturbance has occurred in the major landscapes of Residual Slopes and Flats and Badlands. These areas have altered vegetative structure and composition and, in some areas, are actively eroding.

Chapter 2 discusses the amount and nature of existing disturbances within the DFPA. Review of aerial photographs (dated 2000), topographic quadrangle maps, as well as field inspection was used to estimate the area of existing disturbance in the project area.

Water Erosion. Although the total area of disturbance is in varying stages of reclamation and revegetation, such disturbance has contributed to accelerated erosion in the project area. Erosion cannot be accurately quantified due to the highly dynamic factors involved (e.g., slope gradients, reclamation, soil type, vegetal cover, transient nature of revegetation, etc.). The Revised Unified Soil Loss Equation (RUSLE) could be used to estimate general magnitudes of erosion resulting from the existing disturbance but, based on discussion with Richard Warner, University of Kentucky

(personal communication), use of the equation to determine concurrent rates of erosion off areas with varying soil slopes is not an appropriate use. Therefore, susceptibility risk of the surface soils to water erosion is based on the K factor of the soil series within the project area and is outlined in Figure 3-8. The K factor represents, according to Toy and Foster (1998): (1) susceptibility of soil or surface material to erosion, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition. NRCS has outlined twelve values to be used, i.e., .1, .15, .17, .2, .24, .28, .32, .37, .43, .49, .55, and .64. The following generalized categories can be estimated for the K factor: low - .1 to .24; moderate - .28 to .32; and high - .37 to .64. Utilizing these categories, Table 3-13 outlines the number of soil map units that would fall into each risk factor for the surface soils.

Erosion rates in the South Baggs natural gas project area (located to the east of the DFPA) were estimated at 1.5 tons/acre/year (t/ac/yr) (USDI-BLM 1999c). According to the 1981 BLM Soil Inventory of the Overland Area, most soils within the Resource Area have a T factor of T-2 t/ac/yr which represents the soil loss tolerance or the amount of soil that a soil can lose through erosion without affecting soil productivity. Based on an erosion rate of 1.5 t/ac/yr, the total natural erosion loss from the project area is 350,313 tons/year (t/y). Assuming incomplete revegetation, accelerated erosion from existing disturbances (1,506.4 acres) is approximately 5 tons per acre per year (USDI-BLM 1999c) or 7,532 t/y. This represents an approximate increase in erosion of 2.2 percent over baseline or natural conditions. This represents a worse-case estimate; the true natural baseline erosion rates are likely less than the value presented here. Most of the eroded soil is contained on-site and is not transported off-site to streams due to low overland flow transport efficiencies. The cumulative effect of existing disturbance combined with proposed and future disturbance is discussed in greater detail in Chapter 4.

Table 3-13. Risk Category for the K Factor.

Risk Category for K	Number of Map Units	Acreage
Low	11	21,912.2
Moderate	21	46,030.6
Moderate-High	24	108,086.2
High	14	26,381.9
Unavailable Information	5	31,131.1

Livestock grazing has contributed to the level of disturbance described above through removal of vegetal cover and soil compaction. These factors contribute to increased erosion above the natural baseline rate. Not enough is known about the intensity of grazing experienced by the project area to predict an increase in soil erosion. However, erosion increases attributable to livestock grazing are well below the estimate provided above.

Wind Erosion. Regarding wind erodibility, NRCS has outlined eight categories to be used, i.e., 1, 2, 3, 4, 4L, 5, 6, 7, and 8. In general, the sandier the soil, the more likely it will move as a result of wind energy. The following generalized risk categories can be estimated for the following WEG designations: no risk - 6, 7, and 8; low - 5; moderate-low - 4 and 5; moderate-high - 3; and high - 1 and 2. Utilizing these categories, Table 3-14 is derived that outlines the number of soil map units that would fall into each risk factor.

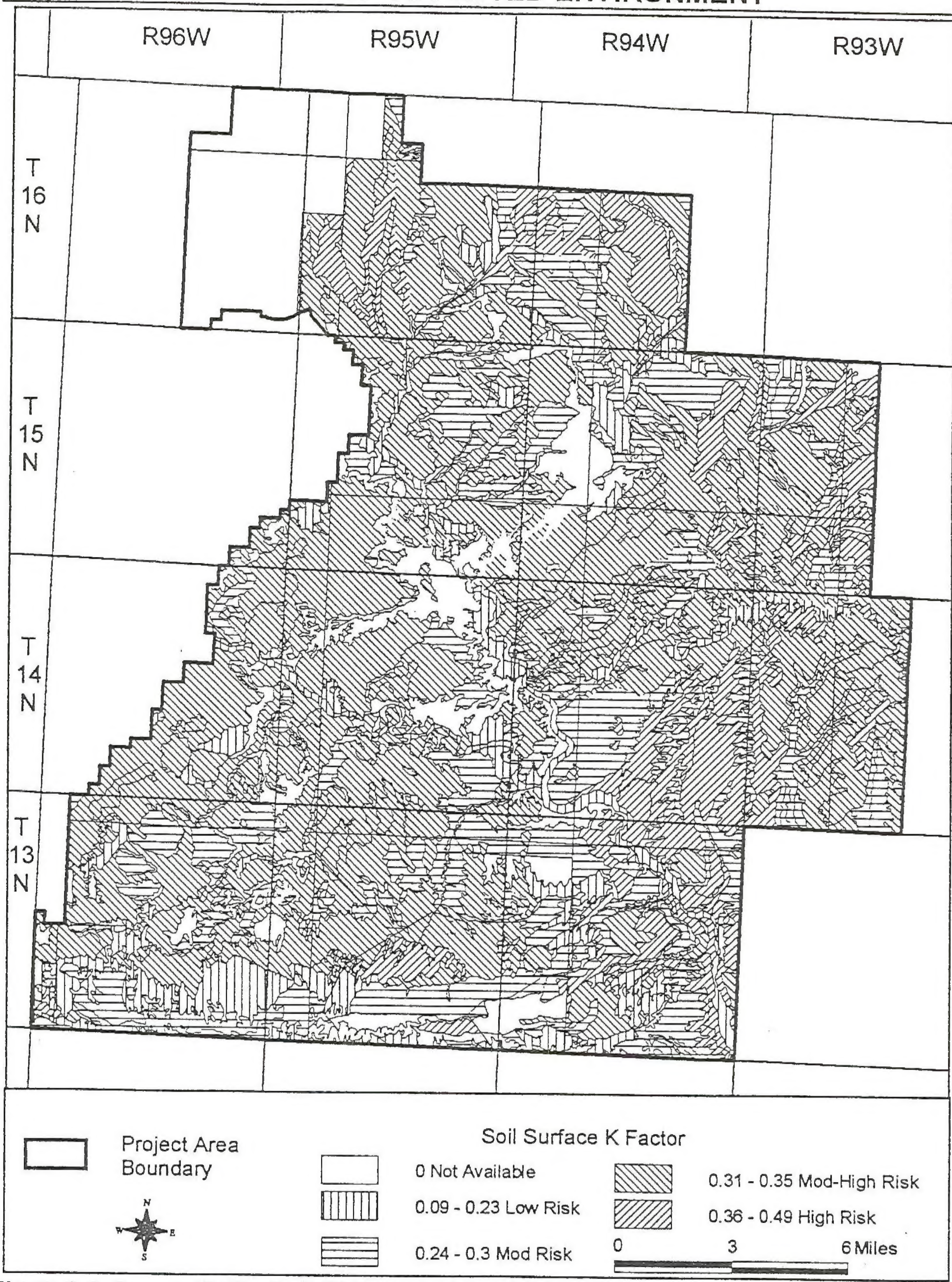


Figure 3-8. Susceptibility Risk (K Factor) of the Surface Soils to Water Erosion within the Desolation Flats Project Area.

Table 3-14. Number of Soil Map Units Falling into each Risk Factor.

WEG	Risk Category	Number of Map Units	Acreage
6, 7, and 8	None	2	478.7
5	Low	9	5,979.5
4	Low-Moderate	24	74,846.4
3	Moderate-High	21	86,272.2
2	High	9	24,094.7
1	High-Very High	5	10,739.4
	Unavailable Information	5	31,131.1

3.4 WATER RESOURCES

Water resources in the project area include both surface water and groundwater. Surface waters include the ephemeral Sand Creek, its named ephemeral tributaries including Red Wash, Hangout Wash, Hartt Cabin Draw, Willow Creek, Haystack Wash, Skull Creek, Grindstone Wash, Redder Cabin Draw and Cedar Breaks Draw, as well as its unnamed ephemeral tributaries. Some of the unnamed and named ephemeral tributaries of Barrel Springs Draw (i.e., Windmill Draw and South Barrel Springs) also occur within the northeastern portion of the project area. There are a small number of named and unnamed seeps and springs, as well as numerous man-made ephemeral and intermittent livestock reservoirs and ponds. The perennial Little Snake River is the most important surface water resource in the general vicinity, but falls immediately outside of the southern and eastern boundary of the project area. Groundwater resources include free water contained within relatively shallow aquifers that are or could be used for domestic, agricultural and/or industrial purposes. The occurrence and distribution of water resources in the project area are dependent on climate, soils, and structural geology (Geology Section 3.1).

3.4.1 Precipitation and Climate

Climatological data from the Rawlins (No. 487533) and Baggs (No. 480484) weather stations are most relevant to the characterization of water resources in the DFPA. The closest comprehensive recording weather station is in Rawlins, approximately 50 miles to the northeast, and is maintained by the USDT FAA. Climatological data are also gathered at Baggs, approximately 10 miles to the east.

Climate. The project area occurs in a continental dry, cold-temperature-boreal climate (Trewartha 1968). This climate is primarily characterized by a deficiency of precipitation (i.e., evaporation exceeds precipitation), and generally has cold temperatures where fewer than eight months of the year have an average temperature greater than 50° F with hot summer days and cool summer nights, but bitterly cold winters.

Temperature. The average annual temperature is 42.2°F at Rawlins and 42°F at Baggs. At Baggs, the average monthly low and high temperatures for January are 5.1°F and 32.9°F, respectively. In contrast, the average monthly low and high temperatures for July are 47.6°F and 85.6°F, respectively (WRCC 2000). In Rawlins, the average number of days per year with a minimum temperature at or below 32°F is 225 (Martner 1986).

Precipitation. Mean annual precipitation is expected to be approximately 11 inches in the project area, with Rawlins and Baggs having an annual average of 9.31 inches and 11.19 inches, respectively. Precipitation is somewhat evenly distributed throughout the year with a peak in May. In Baggs, the average monthly precipitation for the month of May is 1.64 inches (WRCC 2000). The majority of precipitation falls as rain from frontal systems and thunderstorms. In regard to intensity of rainfall events, the 50-year, 24-hour precipitation rate is 2.2 inches (Miller et al. 1973). Average total snowfall depth for the year at Baggs is approximately 41 inches, with the greatest snowfall occurring in December and January (WRCC 2000). Due to the effect of ablation and snow drifting, a discontinuous snow cover is usually present during the winter.

Other Climate Characteristics. Mean annual evaporation ranges from 55 inches (lake) to 75 inches (pan) and potential annual evapotranspiration is roughly 20 inches (Martner 1986). Compared to the average annual precipitation of 11 inches, this gives an average annual deficit of approximately 9 inches. The prevailing wind is from the west and southwest at an average of 14.3 miles per hour. Violent weather is relatively common in the area; thunderstorms occur an average of 30 days per year and hail an average of three days per year. These meteorological and climatological characteristics of the project area combine to produce in general a predominantly dry, cool and windy climate punctuated by quick, intense precipitation events.

3.4.2 Surface Water

3.4.2.1 Surface Water Quantity

Surface water is relatively rare or infrequent within the project area. The project area is predominantly drained by Sand Creek, a tributary of the Little Snake River. Tributaries of the Barrel Springs Draw watershed that discharges into the Muddy Creek drainage, which is also a tributary of the Little Snake River, drain the northeastern portion of the study area. As shown on Figure 3-9, numerous stream channels occur within the DFPA but the vast majority of the channels, named and unnamed, are ephemeral (i.e., carry water only in direct response to snow melt and precipitation events). Typically under this regime, streamflow will last for only a short period of time after the runoff-producing event. The drainage area of Sand Creek is 584.57 mi^2 with 314.47 mi^2 (53.80%) percent in the project area. The Barrel Springs drainage area is 337.16 mi^2 with 45.8 mi^2 (13.49%) in the project area.

The project area falls entirely within the Little Snake River drainage basin (USGS Basin #14050003). There are no internally drained areas in the project area. The Little Snake River drains the largest basin in the Yampa River basin (Driver et al. 1984). It joins the Yampa River in northwest Colorado. The Yampa River flows southwest to its confluence with the Green River in Utah. The Green River drains to the Colorado River, which ultimately flows to the Pacific Ocean.

Flow within the stream channels correlates directly with precipitation; surface runoff occurs during spring and early summer as a result of snowmelt and rainfall (Lowham et al. 1985). Streams receive little to no support from groundwater discharge to sustain flow; consequently, there are extended periods of time when drainages are dry. A few named and unnamed springs are located at higher elevations near the headwaters of some of the tributaries to Sand Creek, although infiltration and evapotranspiration quickly exceed the discharge rates and intermittent streamflow is sustained only for short distances downstream. Active stream channels in the project area exhibit ephemeral flow only during snowmelt and high-intensity, short-duration summer thunderstorms.

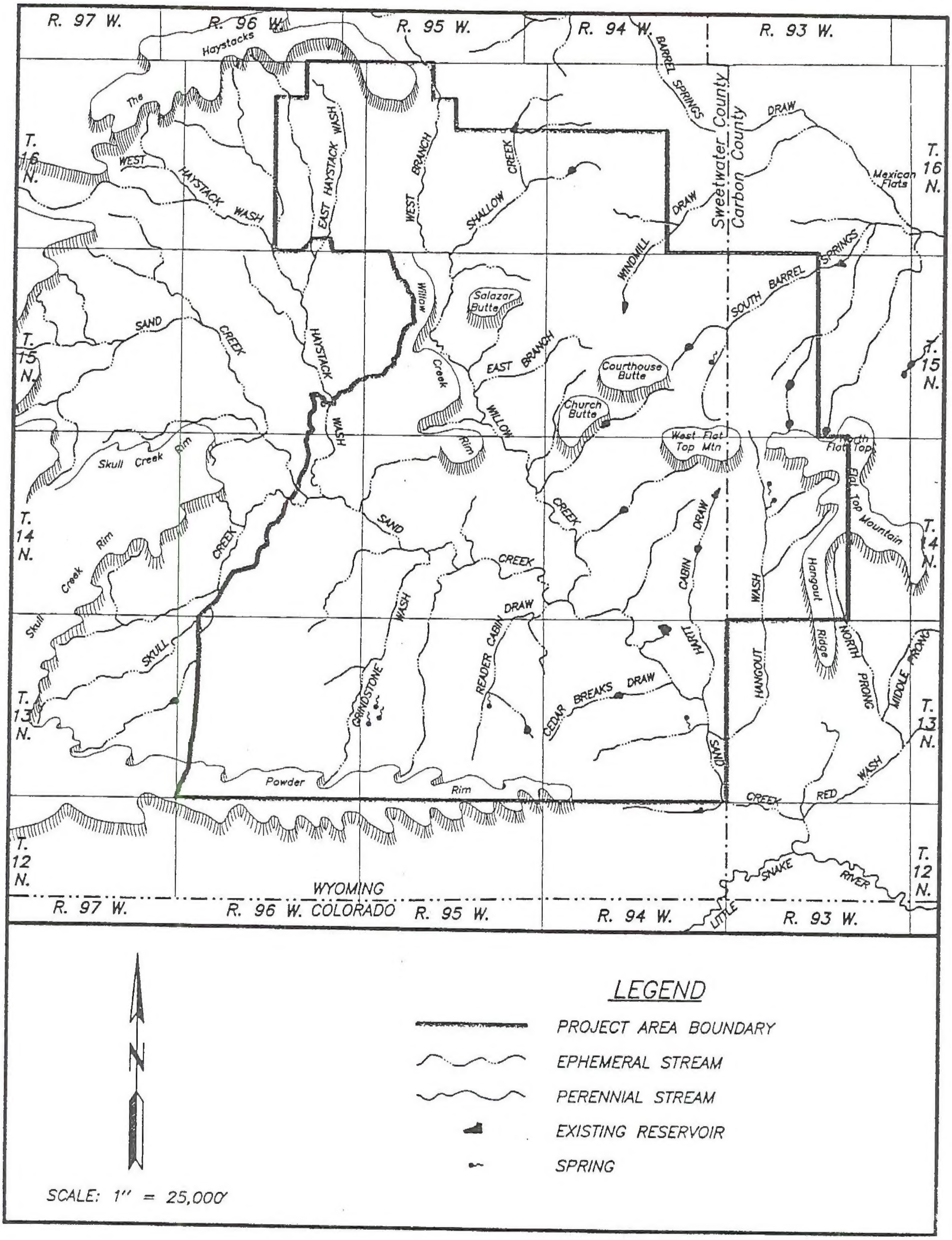


Figure 3-9. Surface Water Features in the Desolation Flats Project Area.

The surficial geology of the project area, which is within the structural Washakie Basin, is characterized by the predominance of Tertiary age rocks of the Uinta, Bridger, Green River and Wasatch Formations. These sediments contain an interbedded mixture of marlstones (calcareous clays), siltstones, mudstones, shales, and fine-grained sandstones characteristic of mixed fluvial and lacustrine deposition (Welder and McGreevy 1966). The type of sediments that accumulated in the structural basin during the Early Tertiary Period are related to their distances from the mountain front source areas and the periodic oscillation of the level of the ancient Green River Lakes that covered the basin. This resulted in a complex interfingering relationship between lake sediments and their laterally equivalent river-deposited sediments. Rocks that accumulated in the river systems along the margins of the basin during the early Eocene comprise the Wasatch Formation (i.e., Cathedral Bluffs Member). Rocks that accumulated in the Green River Lakes system comprise the Green River Formation (i.e., Laney Shale Member). During the middle to late Eocene Epoch, the last Green River Lake filled with chemically precipitated rocks, intermittent volcanic ash falls, and fine-grained sediments of the Uinta and Bridger Formations (which together are also called the Washakie Formation). The DFPA lies roughly at the center of the basin; therefore, bedrock sediments on the surface tend to be fine-grained, typical of those that accumulated in flood plain and lacustrine environments.

The types of particles that comprise the sedimentary bedrock largely determine the texture of the soil that develops from that deposit. Therefore, most of the soils within the project area generally have a heavy clay texture with low infiltration and permeability rates. In addition, a high rate of natural or geologic erosion is evidenced by the badland-type topography, which predominates much of the project area's landscape. Badlands and rock outcrops have very little to no soil development upon their steep surfaces. Soil and bedrock susceptibility to water erosion can be severe due to low permeability, and the area's sparse vegetative cover exposes more surface to raindrop impact erosion. As a result of the project area's slow infiltration rates, steeply sloping surfaces and sparse vegetal cover, runoff potential is very high.

Precipitation events are highly erratic, both temporally and areally, within the project area. Thunderstorms can produce rapid, brief, stream flows and high-intensity thunderstorms can cause equally intensive runoff and flash flooding. The surface erosion and sediment deposition that result from such intense storms in this arid to semi-arid environment have resulted in the formation of stream channels having the fluviogeomorphic characteristics of arroyos (i.e., vertical walled and flat floored). The larger, higher-ordered stream channels in the flat terrain areas are broad and somewhat indistinct. The fine silts and clays in these channels are carried away, leaving behind channel deposits of braided sand-sized materials. Conversely, surface runoff generation may be insufficient in some of the lower-ordered subwatersheds to produce enough streamflow to maintain active channels having fluviogeomorphic characteristics such as channel banks, beds, bars, etc. Some stream courses identified on USGS topographic maps may grade between active channels and vegetated swales along their length.

There are no USGS surface water gaging stations in the project area. The closest USGS gages are located on Muddy Creek near Baggs and on the Little Snake River near Dixon. The USDI-BLM (1994b) has collected some surface flow data for Barrel Springs and Barrel Springs Draw, both of which are located north and east of the project area boundary. Barrel Springs has an average flow of less than 0.1 cfs and Barrel Springs Draw has been measured to have an average flow of less than 1.0 cfs. Muddy Creek, which exhibits an intermittent to perennial flow regime, has an average discharge of 8.0 cfs. Maximum instantaneous and minimum daily recorded flows on Muddy Creek are 738 cfs and no flow, respectively. Given the relatively dry climate of the project area and the lack of well established active channels, mean annual runoff (or watershed yield) is relatively low

at less than 0.5 inches per year, or about five percent of the total annual precipitation (Wyoming Water Research Center 1990).

There are no naturally occurring lakes or ponds in the project area. Some drainages have been diked to impound water for livestock use and some small ponds have been constructed to contain water produced from existing gas wells. There are over fifty small man-made reservoirs and ponds distributed throughout the project area, most of which are not readily identifiable on 7.5 minute USGS topographic maps. The records of the Wyoming SEO were used for this inventory, as these small reservoirs are difficult to locate either by field inspection or on recent aerial photographs. Water levels in impoundments on the ephemeral channels are erratic and fluctuate in response to the frequency of runoff events. The two largest reservoirs, each estimated to be less than 20 acres in surface area when full, are located in T15N:R94W and are on Windmill and South Barrel Springs Draws. The source of water for these reservoirs appears to be primarily from surface runoff as there are no springs located upstream.

A small number of named and unnamed springs and seeps occur in the project area. Most naturally occurring springs in the project area have been developed for livestock use and small detention reservoirs are generally associated with them. Some springs can contribute a small amount of inflow to drainages. Typically, due to evaporation, transpiration, seepage and freeze-up, flow from these springs will extend for only a short distance downstream from the spring face. The major named springs that are shown on USGS topographic maps and listed as sources of surface water rights with the SEO are Rotten Spring, Sand Spring, Doby Spring and Chimney Spring (located in T13N:R95W), Dripping Rock Spring and Hangout Spring (located in T14N:R93W), McPherson Spring (located in T13N:R94W), and South Barrel Spring (located in T15N:R94W). Oil and gas development has also created a few flowing wells that are allowed to discharge water perennially for livestock. These wells usually support small detention reservoirs. Springs and flowing wells are important sources of water for wildlife as well as livestock.

Based upon a recent (December 2000) review of the SEO records, there are approximately 60 currently active surface water rights in the project area. These surface water rights are all associated with livestock watering facilities (i.e., ponds, reservoirs, and improvements such as ditches, pipelines and enlargements), with the exception of two rights that are for irrigation use. Roughly two-thirds of these permits are unadjudicated and the other third are adjudicated. These permit rights total approximately 325 acre-feet per year.

3.4.2.2 Surface Water Quality

Surface water quality in semiarid regions is seasonal and dependent on the magnitude and frequency of discharge events, although typically somewhat high in dissolved solids concentration. During periods of little to no precipitation, evaporation and capillary action produce a salt residue on the surfaces of bedrock, soils and channel deposits. Runoff from rainfall and snowmelt then periodically flushes the accumulated salts downstream. During high-intensity thunderstorm events the dissolved solids concentration will commonly decrease after the initial flushing of salts has taken place. During less intense, low-flow events the dissolved solids concentration may increase in the downstream reaches. In less arid areas, less evaporation and more frequent flushing of accumulated salts would generally result in lower dissolved solids concentrations throughout the year. Due to the highly erosive nature of the area, relatively high suspended sediment concentrations are expected.

As indicated in the previous section, there are no USGS streamflow gaging stations within the project area, nor does the USGS have any established surface water quality stations in the project area. The USDI-BLM and USGS have collected a small number of miscellaneous surface water grab samples (approximately 12) for partial chemical analyses within the project area (WRDS 2000). Water quality information from this small data set is too brief to be conclusive. The USDI-BLM (1994b) has accumulated all available surface water quality data in the general vicinity of the project area, and a general synopsis and discussion of these data are included in the Draft EIS South Baggs Area Natural Gas Development Project (USDI-BLM 1999c). Based upon that discontinuous data set, the following surface water quality conditions can be expected in the general vicinity of the project area: water temperature is relatively high (>20°F); dissolved oxygen is moderate to high (9 mg/l); conductivity is high (>2,000 to 5,000 µmhos/cm); pH is neutral to alkaline (7 to 10); turbidity is low to moderate (10 to 900 NTU); sodium is the predominant cation and bicarbonate and sulfate are the predominant anions; total hardness is moderate to high (40 to 990 mg/l); total alkalinity is moderate to high (100 to 2,890 mg/l); and total dissolved solids are high (as much as 12,800 mg/l). Miscellaneous grab samples that were analyzed for total iron indicate moderate to high concentrations (1 to 100 mg/l). Information on other constituents such as selenium, fluoride, boron and other various trace metals is not available. The data that are currently available suggest that surface water quality in the project area is not suitable for domestic uses and is marginally suitable for livestock and industrial uses. In general, surface water, when present in the DFPA, is expected to be poor to very poor quality due primarily to high turbidity, suspended solids and dissolved solids concentrations.

Point pollution sources have not been documented in the project area, and if they have occurred, they were probably accidental and of limited areal extent and of short duration.

The DFPA is located in the Colorado River Basin and, as such, is subject to review by the Colorado River Basin Salinity Control Forum. As one of the seven member states of the forum, Wyoming reviews point and nonpoint sources of salinity in the Wyoming portion of the Colorado River Basin through a watershed protection program administered by the Water Quality Division of the WDEQ (CRBSCF 1999).

The WDEQ (WDEQ 2000) classifies Wyoming surface water resources according to quality and degree of protection. Four classes have been identified as follows:

Class 1. Those surface waters in which no further water quality degradation by point source discharges other than from dams will be allowed. Nonpoint sources of pollution shall be controlled through implementation of appropriate best management practices. Considerations employed during the designation of these waters include water quality, aesthetic, scenic, recreational, ecological, agricultural, botanical, zoological, municipal, industrial, historical, geological, cultural, archaeological, fish and wildlife, the presence of significant quantities of developable water and other values of present and future benefit to the people.

Class 2. Those surface waters other than Class 1, determined to be presently supporting game fish, have the hydrologic and natural water quality potential to support game fish, or include nursery areas or food sources for game fish.

Class 3. Those surface waters, other than those classified as Class 1, which are determined to be presently supporting nongame fish only, have the hydrologic and natural water quality potential to support nongame fish only, or include nursery areas or food sources for nongame fish only.

Class 4. Those surface waters, other than those classified as Class 1, which are determined to not have the hydrologic or natural water quality potential to support fish and include all intermittent and ephemeral streams. Class 4 waters shall receive protection for agricultural uses and wildlife watering.

Sand Creek, Windmill Draw and the North Prong Red Wash have all been classified as Class 4 streams. Red Wash has been classified as a Class 3 Stream. All other streams in the project area are undesignated and by default take on the classification of the first stream they run in to. The Little Snake River has been designated a Class 2 stream. The portion of the Little Snake River below Baggs has been further classified as a secondary contact recreation water which adds fecal coliform restriction normally reserved for Class 1 surface water bodies.

The WGFD has also classified surface waters in regard to the quality of fishery habitat and/or the importance of fisheries provided by the surface water bodies. All streams within the project area are Class 5 streams (incapable of supporting fish) (WGFD 1991). Muddy Creek, located just east of the project area is a Class 4 stream (low production trout waters/fisheries frequently of local importance, but generally incapable of sustaining substantial fishing pressure). The Little Snake River below Dixon is also a Class 4 stream.

3.4.2.3 Waters of the U.S.

Most of the surface water features in the project area qualify as Waters of the United States. Waters of the U.S. include the territorial seas; interstate waters; navigable waterways (such as lakes, rivers, and streams), special aquatic sites, and wetlands that are, have been, or could be used for travel, commerce, or industrial purposes; tributaries; and impoundments of such waters. All channels that carry surface flows and that show signs of active water movement are waters of the U.S. Similarly, all open bodies of water (except ponds and lakes created on upland sites and used exclusively for agricultural and industrial activities or aesthetic amenities) are waters of the U.S. (EPA 33 CFR § 328.3[a]). Such areas are regulated by the EPA and Department of Army COE. As described previously, many of the drainage channels identified on the USGS topographic maps are vegetated swales, which are not considered to be waters of the U.S. by the COE. Any activity that involves discharge of dredge or fill material into or excavation of such areas is subject to regulation by the COE pursuant to Section 404 of the Clean Water Act (CWA). Activities that modify the morphology of stream channels are also subject to regulation by the Wyoming SEO. Special aquatic sites and wetlands are discussed in greater detail in the Vegetation Section (Section 3.5).

3.4.3 Groundwater

The project area occurs in the Colorado Plateau and Wyoming Basin groundwater regions described by Heath (1984); the Upper Colorado River Basin groundwater region described by Freethey (1987); or the Great Divide and Washakie basins by Collentine et al. (1981) and Welder and McGreevy (1966). Groundwater resources include deep and shallow, confined and unconfined aquifers. Site-specific groundwater data for the project area is limited. Existing information comes primarily from oil and gas well records from the WOGCC, water well records from the Wyoming SEO and from the USGS (Weigel 1987). Regional aquifer systems pertinent to the project area are discussed by Heath (1984), Freethey (1987), Driver et al. (1984), and Lowham et al. (1985). Basin-wide evaluations of hydrogeology specific to the project area have been investigated by Collentine et al. (1981). The most relevant hydrogeologic study specific to the project area is by Welder and McGreevy (1966).

3.4.3.1 Location and Quantity

Several rock units can be classified as water-bearing zones (aquifers) within the Washakie and Great Divide structural basins of Wyoming. As described in Table 3-15, these aquifers vary in thickness, potential yields, and water quality. Not all of the geologic formations listed in Table 3-2 are encountered within the DFPA (Geology Section 3.1). Those occurring in the project area include Quaternary deposits; the Tertiary Washakie (Uinta and Bridger), Laney Shale Member of the Green River, Wasatch, and Fort Union formations; the Upper Cretaceous Lance, Fox Hills, Mesaverde, and Frontier formations; the Lower Cretaceous Cloverly Formation; the Jurassic Sundance Formation and Nugget Sandstone; and the Paleozoic rocks. As indicated in Table 3-15, these aquifers are all separated by confining layers and the expected yields and permeabilities are generally low.

Quaternary aquifers in the Washakie Basin are comprised of alluvial deposits along the major drainages and isolated windblown deposits. Groundwater flow within the sandy Quaternary aquifers is typically downward toward an underlying permeable Tertiary strata (Collentine et al. 1981), or downslope as determined by the topography. The Tertiary aquifer system is the most extensively distributed and accessible source of groundwater in the Washakie and Great Divide basins (Collentine et al. 1981). The Tertiary aquifer system is described as all the water-bearing strata between the Laney Shale Member of the Green River Formation and the Fox Hills Sandstone, inclusive. The Mesaverde Formation is also a major aquifer throughout the two basins, although due to water quality variability, it is considered a groundwater source near outcrop areas only. Likewise, all of the water-bearing units below the Mesaverde are considered important sources of groundwater only in the vicinity of their outcrops due to water quality considerations. The majority of groundwater presently withdrawn from the Washakie Basin is from the Tertiary aquifer system, and where drilling depths permit, the Mesaverde aquifer. Groundwater withdrawals by the oil and gas industry are principally a by-product of oil and gas production and consist of water derived from Paleozoic rocks (Collentine et al. 1981).

Welder and McGreevy (1966) found that sandstone is the principle water-bearing strata of the Washakie Basin. Individual sandstones vary greatly in distribution and character. In the Great Divide Basin, sandstone aquifers of the Wasatch Formation are probably the most significant in terms of areal distribution, shallow depth and general availability of groundwater for beneficial use (i.e., livestock water). The Wasatch and older aquifers in the Washakie Basin though are generally deeper and less accessible to wells than in the Great Divide Basin. Relatively impermeable beds of marlstone, claystone, siltstone and shale in the Green River and Washakie formations overlie the Wasatch Formation throughout most of the Washakie Basin (Welder and McGreevy 1966).

As stated previously, the project area is located near the center of the Washakie Basin. The shape of the basin is nearly symmetrical and the strata in the basin dip toward the center at 2 to 12 degrees. The total thickness of sedimentary rocks near the center of the structural basin may exceed 25,000 feet. Groundwater in the basinward-dipping strata is almost entirely found in confined aquifers, although it also occurs under unconfined conditions locally in some alluvial valleys and where saturated rocks are near the surface (Welder and McGreevy 1966). The movement of groundwater in the surficial Eocene strata (i.e., Laney Shale Member of the Green River Formation and the Washakie Formation) is probably controlled by the topography of the basin and likely moves out of the basin beneath surface drainages. Welder and McGreevy (1966) suggest that the direction of groundwater movement in the deeper formations is downdip toward the center of the structural basin, and upward into the overlying formations. Recharge to the water-bearing strata of the Washakie Basin is principally from the infiltration of precipitation (direct rainfall,

Table 3-15. Hydrostratigraphy of Southwest and South Central Wyoming, Including the Great Divide and Washakie Basins.

ERA	PERIOD	GEOLOGIC UNIT	THICKNESS (ft)	HYDROLOGIC PROPERTIES
Cenozoic	Quaternary		0-70	• Sand and gravel deposits; fine-grained lake deposits produce poor yields • Used extensively in Little Snake River valley and area north of Rawlins uplift • Well yields generally <30 gpm; springs south of Ferris Mtns flow up to 20 gpm • Transmissivity estimates from area east of Rock springs uplift 168 to 560 gpd/ft • Permeabilities from area east of Rock Springs uplift from 21 to 62 gpd/ft^2 • TDS vary from 200 > 60,000 mg/l
	Tertiary	North Park Formation	0-800	• Minor aquifer, supplies excellent quality spring water to Rawlins • Three wells yield 4 to 20 gpm • Transmissivity estimates from 2 pump tests; 150 and 1,000 gpd/ft • TDS generally < 500 mg/l
		Browns Park Formation	0-1,200	• Excellent aquifer with good interstitial permeability; possible saturated zone 870 ft thick • Well yields range from 3 to 30 gpm • Transmissivity estimates from 100 to 10,000 gpd/ft • Numerous springs maintain baseflow of streams south of the Rawlins area; one spring flows 343 gpm • TDS generally < 500 mg/l
		Bishop Conglomerate	0-200+	• Major aquifer in Rock Springs uplift area • Absence of thick, saturated zones limits well yields; one well yields 42 gpm • Good interstitial permeability
		Uinta/Bridger Formations (Washakie Formation)	0-3,200+	• Relatively impermeable unit with only one questionably identified well and no spring data reported • Very low yields are expected
		Green River Formation (including Tipton, Wilkins Peak, and Laney members)	0-1,500	• Laney Member wells yield up to 200 gpm; other members relatively impermeable and would produce low-yield wells • Laney transmissivity range 110 to 300 gpd/ft; permeability averages 10 gpd/ft^2 • TDS generally <3,000 mg/l

Table 3-15. Continued.

ERA	PERIOD	GEOLOGIC UNIT	THICKNESS (ft)	HYDROLOGIC PROPERTIES
Cenozoic	Tertiary	Wasatch Formation	0-4,000+	• Major aquifer; water-bearing sandstone lenses yield 5 to 250 gpm although most yield 30 to 50 gpm; possible yields of 500 gpm from thick, saturated sequences • Wells tapping the lower sands are artesian in some areas • Transmissivity estimates range from 150 to 10,000 gpd/ft • Porosity and permeability are 16 to 38 percent and 0.04 to 18.2 gpd/ft^2, respectively • TDS generally < 1,000 mg/l but some over 3,000 mg/l
		Battle Springs Formation	0-4,700	• Major aquifer in eastern Great Divide Basin • Well yields range from 1 to 157 gpm • Transmissivity estimates from 29 to 3,157 gpd/ft • Porosity at one oil field was 15 to 25 percent • TDS generally < 1,000 mg/l
		Fort Union Formation	0-2,700+	• Major aquifer, especially around border of basins; discontinuous, isolated water-bearing zones • Well yield ranges from 3 to 300 gpm • Transmissivity estimate generally <2,500 gpd/ft • Porosity 15 to 39 percent • Permeability <1 gpd/ft^2; permeability largely fault-related on east side of Rock Springs uplift • TDS generally from 1,000 to 5,000 mg/l
Mesozoic	Upper Cretaceous	Lance Formation	0-4,500+	• Minor aquifer, with well yields generally <25 gpm • Transmissivity estimates generally <20 gpd/ft, with some estimates up around 150 to 200 gpd/ft • Oil field porosity 12 to 26 percent • Oil field permeability 0.007 to 8.2 gpd/ft^2 • TDS generally from 1,000 to 5,000 mg/l
		Fox Hills Sandstone	0-400	• Minor aquifer • Well and spring yields not available • Porosity 20 percent • Transmissivity 10 to 20 gpd/ft • Permeability 0.9 gpd/ft^2

Table 3-15. Continued.

ERA	PERIOD	GEOLOGIC UNIT	THICKNESS (ft)	HYDROLOGIC PROPERTIES
Mesozoic	Upper Cretaceous	Lewis Shale	0-2,700+	• Constricting layer mostly of impermeable shale but scattered sandstone lenses may be capable of yielding stock water supplies • Porosity ranges from 6 to 24 percent • Permeability ranges from 0.002 to 0.9 gpd/ft^2 • Transmissivity ranges from 0.03 to 50 gpd/ft
		Mesaverde Formation (includes Blair, Rock Springs, Ericson and Almond formations)	0-2,800	• Major aquifer with maximum well yield of 470 gpm from Rock Springs Formation; most yield less than 100 gpm • Transmissivity estimates generally < 3,000 gpd/ft and much lower in the Almond Formation • Porosity ranges from 8 to 26 percent • Ericson Formation is best water source near Rock Springs uplift • TDS range from 500 to over 50,000 mg/l (below 1,000 mg/l only at outcrops)
		Baxter Shale (includes Cody and Steele shales and Niobrara Form)	2,000-5,000+	• Major regional constricting layer throughout area west of Rawlins uplift • Thin sandstone beds may yield small quantities of water, but high TDS concentrations likely
		Frontier Formation	190-900+	• Productive aquifer; yields range from 1 to >100 gpm • Transmissivity estimates 15,000 to 20,000 gpd/ft for water well pump tests; however, generally <100 gpd/ft for drill stem tests, with maximum of 6,500 gpd/ft • TDS range from 500 to 60,000 mg/l (<1,500 mg/l near outcrops)
	Lower Cretaceous	Mowry Shale	150-525	• Regional constricting layer; well and spring data not available
		Thermopolis Shale (includes Muddy Sandstone Member)	20-235	• Leaky confining unit; water produces from Muddy Sandstone Member in northeast Great Divide Basin • Well and spring data not available
		Cloverly Formation	45-240	• Major aquifer which crops out on Rawlins uplift; deeply buried over most of area • Well yields range from 25 to >120 gpm • Transmissivity estimates range from 1 to 1,700 gpd/ft (combined water well and drill stem) • TDS range from 200 to 60,000 mg/l (1,500 mg/l near outcrops)

Table 3-15. Continued.

ERA	PERIOD	GEOLOGIC UNIT	THICKNESS (ft)	HYDROLOGIC PROPERTIES
Mesozoic	Upper Jurassic	Morrison Formation	170-450+	• Confining unit • Well and spring data not available
		Sundance Formation	130-450+	• Artesian flow to several wells in Rawlins area • Well yields between 27 and 35 gpm • Transmissivity ranges from 12 to 3,500 gpd/ft • TDS range from 1,100 to 40,000 mg/l (<1,500 mg/l near outcrops)
	Lower Jurassic-Upper Triassic	Nugget Sandstone	0-650+	• Well yield data limited but range from 35 to 200 gpm • Maximum transmissivity from drill stem tests 2,166 gpd/ft • TDS range from 1,100 to 40,000 mg/l (<1,500 mg/l near outcrops)
	Triassic	Chugwater Formation	900-1,500+	• Confining unit; hydrologic data not available
Mesozoic/ Paleozoic	Lower Triassic-Permian	Phosphoria Formation	170-460	• Water-bearing capabilities poorly known; probably poor due to low permeability of rock units • TDS generally between 5,000 to 10,000 mg/l
Paleozoic	Permian-Pennsylvanian	Tensleep Formation	0-840+	• Important water-bearing zone; well yields range from 24 to 400 gpm • One spring flows 200 gpm in Rawlins area • Transmissivity generally low, range 1 to 374 gpd/ft • TDS generally > 3,000 mg/l
	Lower and Middle Pennsylvanian	Amaden Formation	0-260+	• Hydrologic data not available; unit probably has poor water-bearing potential due to predominance of fine-grained sediments • TDS generally > 10,000 mg/l
	Mississippian	Madison Limestone	5-325+	• Major aquifer; excellent secondary permeability development due to solution channeling, caverns, and fractures • Well yields up to 400 gpm • Transmissivities highly variable • TDS range from 1,000 to >10,000 mg/l
	Cambrian	Undifferentiated	0-800+	• Major water-bearing zone, especially near Rawlins • Well yields between 4 and 250 gpm • Transmissivity data are suspect • TDS generally <1,000 mg/l but some areas with 5,000 to 10,000 mg/l
Precambrian			unknown	• Frequently used aquifer in northwestern corner of Great Divide Basin near South Pass City • Well yields typically range from 10 to 20 gpm • Reported transmissivities are <1,000 gpd/ft • Generally high permeability in fractured and weathered zone in upper 200 ft of unit

1 - Adapted from Collentine et al. (1981); additional sources include Lowham et al. (1985), Heath (1984), and Freethey (1987)

overland flow and snow melt). However, most of the precipitation leaves the area as surface runoff before it can infiltrate. The estimated recharge rate for the general area ranges from 0.01 to 2.0 inches per year (Heath 1984). Groundwater discharge from the basin is principally by evaporation and underflow beneath drainageways. Discharge via water wells and transpiration by plants is not significant (Welder and McGreevy 1966).

A recent (December 2000) SEO records review revealed 33 currently active groundwater permits in the project area. They are apportioned as follows: 17 stock, 14 miscellaneous, 1 industrial, and 1 domestic. The USDI-BLM is the applicant for all 17 permits designated for stock use. Of these 17 permits, 5 are springs that yield from 1.25 gpm to 20 gpm, 1 is a flowing well that yields 25 gpm, and the other 11 are wells that yield 5 to 10 gpm via windmills. The reported completion depths of these 12 stock-use water wells range from 3 feet to 1,300 feet, and the static water level depths range from ground surface (if flowing) to 135 feet below ground level. All 15 of the permits designated for miscellaneous and industrial use are associated with the oil and gas industry. These groundwater permits are for water wells that are supplying water for drilling deep oil and/or gas wells. The reported completion depths of these 15 wells (6 of which have no information) range from 700 to 1,440 feet, the static water level depths range from 50 to 580 feet, and the yields range from 40 to 105 gpm. The one permit designated for domestic use is located in the NE1/4NE1/4 of Section 15, T16N:R96W. The reported completion depth of this well is 420 feet, the static water level depth is 148 feet, and the yield is 12 gpm. There are also over 120 cancelled and/or abandoned groundwater rights within the project area, essentially all of which were for well permits associated with the drilling of oil and gas wells.

The majority of the groundwater in the vicinity of the DFPA is obtained from Tertiary units. Total estimated use in the Washakie Basin is between 80,000 and 89,000 acre-feet per year (Collentine et al. 1981). Regional development of groundwater resources has been negligible.

3.4.3.2 Groundwater Quality

Groundwater quality is largely related to the depth of the aquifer and the rock type. The quality of water in the various geologic formations underlying the Washakie Basin ranges from poor to good (Welder and McGreevy 1966). The total dissolved solids (TDS) concentration is an indication of salinity. TDS concentrations ranging from less than 1,000 mg/l (considered fresh) to roughly 2,000 mg/l (slightly saline to saline) is typically found within Quaternary aquifers, shallow members of the Tertiary aquifer system, and near the outcrop areas of the Mesaverde Formation and older aquifers. The total dissolved solids concentration is usually higher when the aquifer is interbedded with lake deposits that contain evaporite minerals (i.e., Washakie Formation). The predominant ions of these low-TDS waters are typically sodium, calcium, bicarbonate and/or sulfate. Shallow groundwater (<1,500 feet) from all members of the Tertiary aquifer system generally have <3,000 mg/l TDS. Limited data from the deeper parts of this system indicate TDS concentrations in excess of 10,000 mg/l, which exceeds Wyoming DEQ groundwater standards for livestock. Salinity increases rapidly away from the outcrop.

Concentrations of several constituents are likely to exceed the WDEQ/LQD domestic water quality standards (Collentine et al. 1981). For example, fluoride concentration in a sample from a well completed in the Laney Shale Member of the Green River Formation southwest of Wamsutter was 2.3 mg/l. Fluoride concentrations in samples from the Quaternary alluvium, Wasatch Formation, and the Mesaverde Group ranged from 2.3 to 7.9 mg/l (Collentine et al. 1981). Driver et al. (1984) indicated that trace elements are generally below standards for drinking water within the Washakie

Basin. Selenium problems are local in nature. Groundwater quality in the project area is generally sufficient for oil and gas well drilling.

The confining beds restrict the movement of groundwater between aquifers, hence, movement of potential contaminants between aquifers. Although there is some downward movement of the water from the shallow surficial units, most of the groundwater movement, if any, is upward from the deeper aquifers to the shallower aquifers. Concerns have been raised for several gas field projects in southwest Wyoming regarding groundwater quality degradation due to the piercing of confining layers and vertical and horizontal migration and mixing of water of variable qualities. Data suggesting this is a current problem in the project area are not available. Improperly completed injection wells could be a potential source of contamination between aquifers.

3.5 VEGETATION AND WETLANDS

3.5.1 General Vegetation

Vegetation in the DFPA is typical of the semi-arid Wyoming Basin floristic region, where precipitation and soil parent material are controlling factors for plant composition. Vegetation often appears sparse.

Most of the DFPA is vegetated with a mix of types typical of the basins of south-central Wyoming. Wyoming big sagebrush steppe (grassland with a canopy of *Artemisia tridentata* ssp. *wyomingensis*) and desert shrub vegetation (a shrub type of shadscale [*Atriplex confertifolia*], greasewood [*Sarcobatus vermiculatus*], and Gardner saltbush [*Atriplex gardneri*]) form a mosaic that covers most of the area. Sparsely vegetated rock and soil also cover substantial parts of this mosaic. Smaller areas of grassland with little sagebrush (the Mixed Grass Prairie cover-type) also are included.

The eastern third of the area contains a band of greasewood mixed with flats and fans dominated by low-growing Gardner saltbush. Stands of juniper woodland mixed with Wyoming big sage steppe grow in a band along the southern edge of the project area. Utah juniper (*Juniperus osteosperma*) is the common species in the basins in southern Wyoming. Narrowleaf cottonwood (*Populus angustifolia*) woodland grows along the Little Snake River between irrigated hay meadows south of the project area. Riparian shrublands grow along tributaries flowing southeast through the eastern part of the DFPA. The species composition in these shrublands is unknown, but basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) and greasewood are likely to be important in this part of the state.

According to large-scale map information from the Spatial Data Visualization Center (SDVC) based on WY-GAP Analysis (Merrill et al. 1996), seven primary cover types are present in the project area: Mixed grass prairie; Wyoming big sagebrush; desert shrub; Saltbush fans and flats; Juniper woodland; Non-vegetated channel; and Basin exposed rock/soil. Non-vegetated channel is a modification of WY-GAP Analysis classification, determined by BLM personnel to more accurately reflect site-specific conditions. Five of these seven cover types are also present in various polygons as secondary cover types e.g., Powder Rim contains the primary cover type Juniper woodland but also has the secondary cover type of Wyoming big sagebrush. In addition, small wetland areas associated with spring development, open water, and disturbed areas are present. Verification of these map unit descriptions of the vegetation resources in the project area is based on field

reconnaissance accomplished in October 2000. Land cover types for the project area are summarized in Table 3-16.

Wyoming big sagebrush primary cover type covers the largest portion of the project area, 74.4 percent or 173,755.3 acres. This cover type has a generally dense cover of Wyoming big sagebrush and other drought-tolerant shrubs over an herbaceous groundcover of forbs and grasses.

Desert shrub is the second most common primary cover type in the project area comprising approximately 8.6 percent or 20,084.6 acres. This cover type has a sparse to dense cover of drought-tolerant shrubs over an herbaceous groundcover of forbs and grasses. Cryptogamic crusts are also present on the surface of the soil. Sagebrush-dominated areas are the most common phase of this cover type. Common herbaceous groundcover species include western wheatgrass (*Agropyron smithii*), bluebunch wheatgrass (*A. spicatum*), Indian ricegrass (*Oryzopsis hymenoides*), Sandberg bluegrass (*Poa secunda*), needlegrass (*Stipa* spp.), common yarrow (*Achillea millefolium*), Indian paintbrush (*Castilleja* spp.), buckwheat (*Eriogonum* spp.), lupine (*Lupinus* spp.), and phlox (*Phlox* spp.).

Table 3-16. Land Cover Types within the DFPA.

Land Cover Type	Primary Acreage	%	Secondary Acreage
Mixed grass prairie	10,509.4	4.5	
Wyoming big sagebrush	173,755.3	74.4	40,440.6
Desert shrub	20,084.6	8.6	61,628.2
Saltbush fans and flats	5,137.9	2.2	
Juniper woodland	15,647.3	6.7	17,178.3
Non-vegetated channel**	1,868.3	0.8	
Basin exposed rock/soil	6,539.2	2.8	113,782.9
Disturbed*	1,506.4*	0.6*	
TOTAL	233,542.0	100.0	

*Existing disturbance of 1,506.4 acres has not been broken out by vegetation type.
**WY-GAP Analysis information modified by BLM personnel (Otto 2002) to reflect site-specific conditions.

A portion of this cover type resembles the "badlands" type described for the adjacent South Baggs area in which there was a very sparse vegetal cover consisting of saltbush (*Atriplex spp.*), Indian ricegrass, greasewood, stemless goldenweed (*Haplopappus acaulis*), and foliose lichens. The following description is from WY-Gap Analysis (Merrill et al. 1996), which provided the map units for cover.

Juniper woodland is the third most common cover type in the project area comprising approximately 6.7 percent or 15,647.3 acres. This cover type is very similar to the desert shrub, but has a sparse to moderate cover of small juniper (*Juniperus* spp.) trees over the typical desert shrub vegetation.

Mixed grass prairie is the fourth most common primary cover type in the project area comprising approximately 4.5 percent or 10,509.4 acres. It is found primarily in the northeastern corner of the project area.

Basin exposed rock/soil is the fifth most common primary cover type in the project area comprising approximately 2.8 percent or 6,539.2 acres. It is found primarily in the northwestern corner of the project area.

Saltbush is the sixth largest primary cover type in the project area comprising approximately 2.2 percent or 5,137.9 acres. It is primarily found in the northeastern portion of the project area.

Non-vegetated channel (Otto 2002) is the last primary land cover unit and comprises approximately 0.8 percent or 1,868.3 acres of the project area. It is located exclusively along Sand Creek in the southeastern corner of the project area. The sandy channel is non-vegetated over long stretches, supporting only isolated patches of shrubs, as well as rushes and sedges associated with tiny, scattered spring/seep sites which lie along the banks and edges of the creek. The springs/seeps produce water (but no flow) throughout and/or at various times during the year. Isolated trees (*Populus* spp.), including scattered shrub willow (*Salix* spp.) were observed near the confluence of Sand Creek and the Little Snake River during fieldwork. Often the transition to upland areas from stream channels is abrupt and precludes development of wetland hydrology or hydric soils.

The total existing disturbance within the DFPA is 1,506.4 acres or 0.6% of the total project area. The total acreage of disturbance has not been broken out by vegetation type; however, most of this disturbance has occurred in the primary cover types of Wyoming big sagebrush, desert shrub, and basin exposed rock/soil cover types. These areas have altered vegetative structure and composition and, in some areas, are actively eroding.

Sand Creek is classified as a riverine intermittent system which covers approximately 1,793.1 acres, or 0.8 percent of the DFPA. Small portions of this area are potential jurisdictional wetlands. Much smaller wetland areas occur at developed or undeveloped springs as subirrigated wet meadow and marsh but they have not been included in the acreage picture. The wet meadow areas are covered by such species as Baltic rush (*Juncus balticus*), foxtail barley (*Hordeum jubatum*), alkali cordgrass (*Spartina* spp.), redtop (*Agrostis stolonifera*), and American licorice (*Glycorrhiza lepidota*). Soils are saturated to their surface for a portion of the growing season but are not inundated for long periods. The marsh cover type is quite limited and occurs in discrete patches within the wet meadow cover type and is dominated by saltmarsh bulrush (*Scirpus maritimus*), creeping spikerush (*Eleocharis palustris*), and common reed (*Phragmites australis*). Marsh areas are inundated for a large portion of the growing season and have saturated soils throughout the growing season. Several springs outlined on the BLM maps for the project area, i.e., Kinney Rim and Baggs, were observed and photographed during October 2000. It is assumed that those springs that were not specifically observed and photographed are similar to the ones that were. It is assumed that, at a minimum, the named springs below are developed; the unnamed spring in Section 18, T13N:R95W was also developed. Those springs identified on the Baggs and Kinney Rim 1:100,000 scale BLM maps are generally concentrated on the north side of Powder Rim and are described in Appendix E. McPherson Spring, Rotten Springs, Carson Springs and an unnamed spring in Section 18, T13N:R95W were viewed in October 2000. Carson Springs is on State Trust, but contains a BLM marker in the field identifying the water body.

Except for the lower reaches of Sand Creek, stream channels in the project area are ephemeral and do not provide sufficient hydrology for wetlands to develop. Wetland vegetation may develop around the margin of water impoundments but are generally not jurisdictional pursuant to the CWA. Existing pond development is generally limited to the northeastern corner of the project area, as depicted on the Baggs and Kinney Rim 1:100,000 scale BLM maps and verified in the field.

Based on field reconnaissance, weed invasion and establishment is minimal within the project area along roads and pipelines as well as at well sites and other areas of disturbance. The State of Wyoming has identified 22 species as noxious (Table 3-17); however, not all may occur in every county. In addition to these species, Carbon County includes Geyer larkspur (*Delphinium geyeri*) (Carbon County Weed & Pest District 2000) and Sweetwater County includes Foxtail Barley (*Hordeum jubatum*). Noxious species known to be present within the DFPA include whitetop (*Cardaria draba*), houndstongue (*Cynoglossum officinale*), Russian knapweed (*Centaurea repens*), and saltcedar (*Tarask spp.*). Most disturbances have exotic species present (i.e., cheatgrass [*Bromus tectorum*]), but few are considered noxious. Hartman and Nelson (2000) identified 428 invasive, exotic (non-native to the state) vascular plants in Wyoming. An undetermined number of these species occur in the DFPA. Areas away from disturbances were observed to have native assemblages of plants.

Several common native and exotic poisonous plants that occur within the project area are halogeton (*Halogeton glomeratus*), milkvetch (*Astragalus* spp.) and locoweed (*Oxytropis* spp.). Other poisonous plants include larkspur (*Delphinium* spp.), horsebrush, greasewood, deathcamas (*Zigadenus* spp.), arrowgrass (*Triglochin maritimum*), tansy mustard (*Descurainia pinnata*), and cocklebur (*Xanthium* spp.). Most of these plants occur in the desert shrub cover type; some occur in wet sites.

Table 3-17. Designated Noxious Weeds in Wyoming.

Scientific Name	Common Name
Agropyron repens	Quackgrass
Ambrosia tomentosa	Skeletonleaf bursage
Arctium minus	Common burdock
Cardaria draba, C. pubescens	Hoary cress, whitetop
Carduus acanthoides	Plumeless thistle
Carduus nutans	Musk thistle
Centaurea diffusa	Diffuse knapweed
Centaurea maculosa	Spotted knapweed
Centaurea repens	Russian knapweed
Chrysanthemum leucanthemum	Ox-eye daisy
Cirsium arvense	Canada thistle
Convolvulus arvensis	Field bindweed
Cynoglossum officinale	Houndstongue
Euphorbia esula	Leafy spurge
Isatis tinctoria	Dyers woad
Lepidium latifolium	Perennial pepperweed
Linaria dalmatica	Dalmatian toadflax
Linaria vulgaris	Yellow toadflax
Lythrum salicaria	Purple loosestrife
Onopordum acanthium	Scotch thistle
Sonchus arvensis	Perennial sowthistle
Tamarisk spp.	Salt cedar

NOTE - *Delphinium geyeri*, Plains larkspur, and *Hordeum jubatum*, Foxtail barley, are considered "County Declared Pest" species in Carbon and Sweetwater Counties, respectively.

3.5.2 Waters of the United States, Including Wetlands

Waters of the United States, including special aquatic sites and wetlands, represent unique and important resources within the project area, although they cover less than one percent of the DFPA. The COE, through the CWA Section 404(b)(1) guidelines and permitting process, has the administrative authority to regulate activities that involve excavation of or discharge of dredge/fill material into waters of the U.S. To be subject to regulation (i.e., jurisdiction) under the federal program, a wetland must have hydrophytic plants, hydric soils, and surface or subsurface water to support such plants and soils. Other administrative directives that involve wetlands protection on federally administered land include the 1977 Executive Orders 11990 (wetland protection) and 11988 (floodplain protection).

Potential wetland areas were initially identified using SDVC data layer derived from National Wetlands Inventory (NWI) maps produced by the FWS. Except for the riverine intermittent nature of the alluvial bottomlands of Sand Creek in the southeastern portion of the project area, most identified areas were small and scattered widely throughout the project area. Based on a review of the 1:24,000 scale NWI maps, classification of the surface drainages and reservoirs/springs are located in Appendix E. Some of the springs identified on the BLM maps do not contain a designation on the NWI maps, i.e., McPherson Springs.

The NWI maps only indicate the potential occurrence and distribution of jurisdictional wetlands because (1) the scale of resolution is small (i.e., 1:24,000); (2) a different method was used to identify wetlands for the NWI maps than for the 1987 COE manual (Environmental Laboratory 1987); and (3) very little ground truth verification of the NWI maps occurred. Wetland investigations were performed in support of, but do not replace, site-specific jurisdictional wetland inventories necessary for CWA 404(b)(1) compliance. Five potential aquatic habitats exist within the project area: marsh, subirrigated wet meadow, riparian scrub, open water, and riverine. The wide channel within the lower reaches of Sand Creek is considered riverine intermittent. Table 3-18 classifies each aquatic habitat according to size and the permanence of water. Within the project area, the condition of these aquatic habitats is highly variable.

Wyoming General Permit 98-08 was developed by the COE to be used statewide for all types of oil and gas activities related to both exploration and production (Johnson 2001). BLM has the authority under this permit (but is not required) to determine if the permit is applicable to activities that are under their jurisdiction. In some cases, GP 98-08 is more restrictive than Nationwide Permits 12 and 14 (e.g., advance notification required for any crossing that impacts more than 0.10 acre). BLM is allowed to approve any activity up to the full limit of GP 98-08. However, the permittee must send a Statement of Compliance to the COE documenting what was done within 30 days after completion for activities that impact over 0.10 acre.

Wetlands have gained considerable recognition for their value in maintaining biological, physical, and socioeconomic systems. The functions wetlands perform include groundwater discharge and recharge, flood storage and desynchronization, shoreline anchoring and dissipation of erosive forces, sediment trapping, nutrient retention and removal, food chain support, wildlife and fish habitat, and heritage values including active and passive recreation and socioeconomic qualities (Adamus and Stockwell 1983).

Professional judgement for determining the functional values of wetlands within the project area was guided by Adamus (1983), Adamus and Stockwell (1983), and Adamus et al. (1987). Values

were assigned for each special aquatic site cover type (Table 3-19). Values inherently incorporate differences created by the dissimilarity in cover type vegetation height, condition, and hydroperiod.

Table 3-18. Classification of Aquatic Habitats within the DFPA.[1]

Aquatic Habitat	Cowardin Classification[1]
Marsh	Palustrine Emergent Persistent Semipermanently Flooded
Subirrigated Wet Meadow	Palustrine Emergent Persistent Seasonally/ Temporarily Flooded; Palustrine Unconsolidated Shore Temporarily/Seasonally/Semipermanently Flooded
Riparian Forest	Palustrine Forested Broad-leaved Deciduous Temporarily Flooded/Saturated
Riparian Scrub	Palustrine Scrub-Shrub Broad-leaved Deciduous Temporarily Flooded/Saturated
Open Water	Palustrine Unconsolidated Shore Seasonally/Semipermanently Flooded; Palustrine Unconsolidated Bottom Temporarily/Semipermanently Flooded; Lacustrine Littoral Unconsolidated Shore Temporarily Flooded
Riverine	Riverine Intermittent Streambed Temporarily Flooded

[1]Source: Cowardin et al. (1979).

Table 3-19. Estimated Functional Values for Aquatic Habitats within the DFPA.

Aquatic Habitat	Function[1]								
	GWR	GWD	FSD	SAD	SED	NRR	FCS	HAB	REC
Marsh	x	x	x	x	x	+	+	+	x
Subirri. Wet Meadow	o	x	x	x	x	x	x	x	o
Riparian Forest	o	x	x	x	x	o	x	x	o
Riparian Scrub	o	x	x	x	x	o	x	x	o
Open Water	+	x	x	o	x	x	+	+	x
Riverine	x	x	o	o	o	o	x	x	o

\+ - major functional value
x - minor functional value
o - no or minimal functional value
[1] - Wetland and Special Aquatic Site Functions Adamus and Stockwell (1983):
GWR = groundwater recharge
GWD = groundwater discharge
FSD = flood storage and desynchronization
SAD = shoreline anchoring and dissipation of erosive forces
SED = sediment trapping
NRR = nutrient retention and removal
FCS = food chain support
HAB = wildlife and fish habitat
REC = active and passive recreation and heritage value

In the project area, the aquatic habitat with the most positive functional characteristics is Marsh; however, the extent of this type is very limited. The aquatic habitat with the least functional value is Riverine. However, it must be noted that the wide, sandy floodplain of Sand Creek, which is the only riverine type in the project area, plays a large role in flood storage and groundwater recharge.

3.6 RANGE RESOURCES AND OTHER LAND USES

3.6.1 Range Resources

The DFPA would occur on land that is within 13 BLM grazing allotments. Eleven of the allotments extend beyond the boundaries of the DFPA and only two are located wholly within the project boundaries. Twelve of the allotments are administered by BLM's RFO and one allotment is administered by the RSFO.

The 12 RFO grazing allotments total over 386,000 acres, including land outside the project area. Of this amount, 87 percent is in federal ownership, 12 percent is private land, and less than one percent is state-owned land. Currently there are over 31,000 animal unit months (AUMs) permitted for cattle, sheep and a small number of horses in these allotments. Calculated acreage per AUM in these allotments averages just over 12 acres. About 89 percent of the allotments have been issued for sheep and 11 percent issued for cattle. The season of use varies for each allotment. Range condition varies from excellent to poor in these allotments, although the vast majority is in the good category. Poor condition rangeland is relatively rare (Otto 2000).

A small portion of the RSFO-administered Rock Springs Grazing Allotment is located in the northwest corner of the DFPA. The portion of this allotment within the project area supports about 57 AUM's of cattle, although it receives little or no use because of lack of water and logistical concerns; the area is difficult to access from the west and north due to topography. The season of use for the allotment is from December through April, and the range condition is considered fair to good with the majority in good condition (Stephenson 2000).

3.6.2 Other Land Uses

The project area encompasses approximately 233,542 acres of mixed federal, state, and private lands. Over 96 percent of the land within the DFPA is in federal ownership (see Tables 1-2 and 1-3 for information on surface and mineral ownership within the project area). The project area is located with in the RFO and RSFO administrative areas, and federal lands within the project area are administered in accordance with the Green River and Great Divide RMP's.

In addition to grazing, other land uses within and adjacent to the DFPA include wildlife habitat, oil and natural gas exploration, development and transmission and dispersed outdoor recreation. No developed recreation facilities exist within or adjacent to the project area. For more information on recreational resources in the project area, see Section 3-9.

BLM ROW and lease data for the sections contained in the DFPA were reviewed for this analysis. Existing ROW's and leases within the project area are numerous and predominately related to oil and gas exploration, production and transmission.

3.6.3 Conformance with Local Land Use Plans

As outlined in Chapter 1, the Sweetwater county portion of the DFPA would be located in an agriculture zone where oil and gas is a permitted use, although certain county permits may be required (see Section 1.4.3.1) (Kot 2000). In Carbon County, the project would be located in an area that has been designated as suitable for oil and gas development by the county land use plan (Pederson Planning Consultants 1998). The Carbon County Land Use Plan contains the following recommendations relevant to the project:

- The Plan recommends that all lands (public and private) within the county suitable for agriculture should be used for future agricultural use, unless existing land uses now preclude agricultural activities. The Plan notes that oil and gas and other mineral development can usually share land and water resources without causing any significant impact to agriculture, and the county recommends and encourages continued use of mineral resources on agricultural lands.

- The Plan states that it is important to conserve the crucial winter range of big game animals, and that the County Planning Commission desires to integrate the consideration of crucial winter range areas for big game animals in its future land management decisions.

- The Plan states that resource conservation should be balanced with the social and economic needs of Carbon County residents.

3.7 WILDLIFE

3.7.1 Introduction

The DFPA supports a rich diversity of wildlife species and wildlife habitats. For the purposes of inventory and subsequent impact analysis, the core analysis area consists of the 233,542-acre project area. Because many wildlife species are highly mobile and readily move in and out of the project area, records of current and historical wildlife species occurrence were obtained for the project area and an approximate six-mile zone surrounding it (WGFD 2000a, WYNDD 2000). A portion of the DFPA (13,285 acres or 5.7%) is located within the MVMA of the RSFO administrative area. The management objective for the MVMA is to provide protection of wildlife, geologic, cultural, watershed, scenic, and paleontological resources (USDI-BLM 1997).

Existing wildlife information for the project area was supplemented through survey data collected by Hayden-Wing Associates (HWA) biologists in 2000 and 2001 (USDI-BLM and HWA 2002, HWA 2002). These data collections consisted of aerial and ground surveys to determine: (1) occurrence of threatened, endangered, proposed, candidate, or sensitive species, and/or potential habitat that may occur on the project area (USDI-FWS 2002a, USDI-BLM 2001); (2) the occurrence, location, size, and burrow density of white-tailed prairie dog colonies; (3) the location and activity status of raptor nests within the project area and two-mile buffer zone; (4) the activity status of all leks within the project area and two-mile buffer zone and search for previously undocumented greater sage-grouse leks; (5) the location and size of critical greater sage-grouse winter habitat and document grouse use of these areas during the winter; and (6) the occurrence, location, and size of mountain plover habitat and document the presence/absence of plover within these habitats. Methods and results of these surveys are summarized in this document and detailed methods and results are included in the Biological Assessment (USDI-BLM and HWA 2002) and Wildlife Technical Report for the Desolation Flats Natural Gas Development Project (HWA 2002). Although wild horses are not managed as a wildlife species by the WGFD and BLM, they are included in the wildlife sections of this document.

3.7.2 Wildlife Habitat

Wildlife habitats that could be affected by the project include areas that would be physically disturbed by the drilling and construction of well pads, related roads, pipelines and production facilities, as well as the zones of influence around activity areas. Zones of influence are defined

as those areas surrounding, or associated with, project activities where impacts to a given species could occur. The shape, and extent of such zones, varies considerably with species and circumstance.

The vegetation within the project area is comprised of a mix of types typical of the basins of south-central Wyoming. General vegetative species composition for each habitat type is characterized in Section 3.5.1 of this document. Except for rock outcrops and piles and exposed soil, the wildlife habitat types correspond with the general vegetation cover types described in Section 3.5.1. Wildlife habitat in the portion of the DFPA in the MVMA includes habitats such as greasewood, saltbush, sagebrush, grassland patches, rock outcrops, and badlands.

3.7.3 General Wildlife

A total of 388 species of wildlife are known, or have the potential, to occur as residents or seasonal migrants within the DFPA and surrounding six-mile buffer (Appendix F). This species list is comprised of 80 mammals, 269 birds, 7 amphibians, 11 reptiles, and 21 fish species. The presence and distribution of these wildlife species was determined from published literature, unpublished data from state and federal agencies, databases from private organizations, and on-site surveys conducted by HWA during 2000 and 2001. Although all species listed in Appendix F are important members of ecological communities, many are common and have a wide distribution within the project area, state, and region. Consequently, the relationship of most of these species to the proposed project is not discussed in the same depth as species which are threatened, endangered, rare, or are otherwise of high interest or unique value.

3.7.4 Big Game

Three big game species: pronghorn antelope (*Antilocapra americana*), mule deer (*Odocoileus hemionus*) and elk (*Cervus elaphus*) occur on the project area. Big game populations are managed by the Wyoming Game and Fish Department (WGFD) within areas designated as herd units and are discussed in that context. The types of big game habitat designated by WGFD (1996, 2000b) discussed in this document include winter, winter/yearlong, crucial winter/yearlong, severe winter relief and spring/summer/fall. Winter ranges are used by a substantial number of animals during winter months (December through April). Winter/yearlong ranges are occupied throughout the year but during winter they are used by additional animals that migrate from other seasonal ranges. Yearlong ranges are occupied throughout the year and do not receive an influx of animals during winter. Crucial range (i.e. crucial winter and crucial winter/yearlong) describes any seasonal range or habitat component that has been documented as a determining factor in a population's ability to maintain itself at a specified level (theoretically at or above the population objective) over the long term. Crucial ranges are typically used 8 out of 10 winters. Severe winter relief habitat is used only during the worst of winters, approximately one in five years. These ranges are used by and allow at least a significant portion of the population to survive the occasional extremely severe winter. Spring/summer/fall ranges are used before and after winter conditions persist. Areas designated as OUT (or non-use areas) contain habitats of limited importance to the species.

Pronghorn. The DFPA is located within the southeastern quarter of the 2,915-square-mile Bitter Creek Herd Unit (Figure 3-10). The Bitter Creek Herd Unit contains Hunt Areas 57 and 58. The boundaries of this herd unit correspond with major roads on the east, west and north sides (State Highways 789 and 430 and Interstate 80) and the Wyoming/Colorado border on the south.

The 1999 post hunt population estimate for the Bitter Creek Herd Unit was 14,700 animals, which is 41.2 percent below the WGFD management objective of 25,000 animals (Table 3-20). Population objectives can change over time and are based upon WGFD management and public input. According to the WGFD (2000b), the low herd numbers can be attributed to limited fawn production during the past five years. No harvest changes were prescribed for antelope in this unit by the WGFD (2000b).

The Bitter Creek herd unit contains winter/yearlong (WYL), crucial winter/yearlong (CWYL), and severe winter relief (SWR) pronghorn habitats as shown on Figure 3-10. Pronghorn use the project area year-round. The project area encompasses 233,542 acres or 12.5 percent of the Bitter Creek Antelope Herd Unit. Approximately 13,612 acres or 5.8 percent of the antelope habitat within the project area is classified as CWYL range by the WGFD. The remainder of the project area (219,930 acres) is classified as WYL range. Pronghorn movement across the project area follows several general migration routes through the central portion of the project area (Figure 3-10).

Pronghorn habitat in the portion of the DFPA located in the MVMA includes an area of crucial winter range (5,708 acres or 41.9% of the CWYL pronghorn range on the DFPA).

Table 3-20. Population Parameters for Big Game Herd Units within the DFPA.

Species	Herd Unit	Unit No.	Hunt Area(s)	Size (mi^2)	Population Estimate (1999)[c]	Population Objective	Density Estimate Objective[a]	Fawn:Doe Ratio
Pronghorn	Bitter Creek	414	57, 58	2,915	14,700	25,000	8.58	48:100[b]
Mule Deer	Baggs	427	82,84, 85,100	3,440	18,300	18,700	5.44	56:100[c]
Elk	Petition	430	124	2,915	300	300	0.10	??:100[c]

[a] = No. Animals (WGFD Population Objective) per Square Mile of Occupied Habitat
[b] = Prehunt Classification
[c] = Posthunt Classification

<u>Mule Deer</u>. The DFPA is located within the southwest portion of the 3,440-square-mile Baggs Herd Unit (Figure 3-11). The boundaries for this herd unit correspond with the Bitter Creek Road on the west, Interstate 80 on the north, and the Wyoming/Colorado border on the south. Much of the eastern border follows the Continental Divide until it intersects Highway 71.

The 1999 post hunt population estimate for the Baggs Herd Unit was 18,300. This estimate is very close to the WGFD management objective of 18,700 (Table 3-20). Population objectives can change over time and are based upon WGFD management and public input. The project area is located within Hunt Areas 82, 84, 85 and 100, where the hunter success rate for 1999 was 56 percent. Hunt Area 82 remains the most popular in the herd unit and sustains the highest levels of hunter use (WGFD 2000b).

The Baggs Herd Unit contains WYL, CWYL, winter (WIN), and spring/summer/fall (SSF) mule deer habitats as shown on Figure 3-11. Approximately 214,112 acres or 91.7 percent of the mule deer habitat on the project area is classified as winter/yearlong range by the WGFD. The remainder of the project area (19,430 acres) is classified as CWYL range. As shown in Figure 3-11, the only

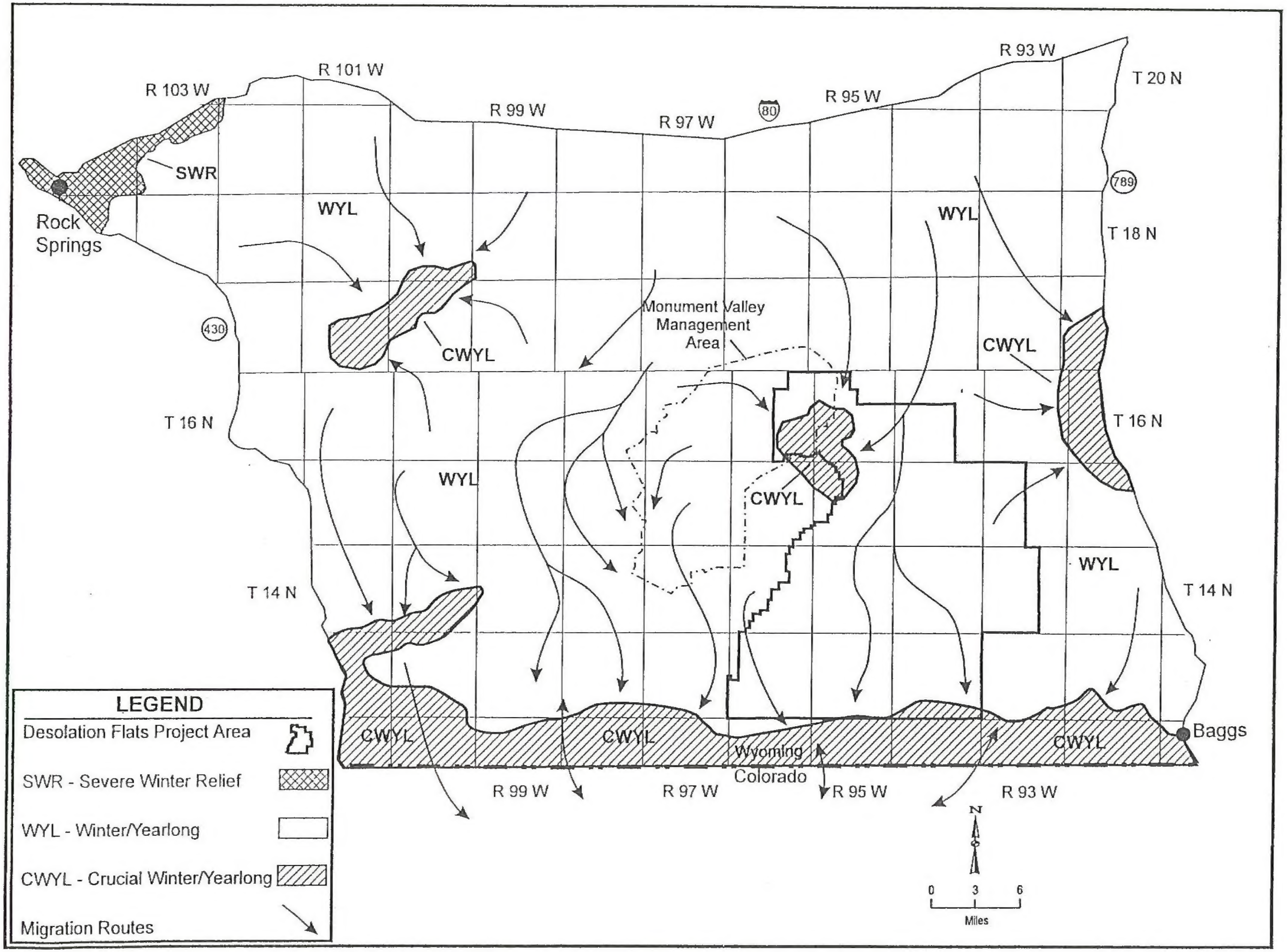


Figure 3-10. Seasonal Pronghorn Antelope Ranges for the Bitter Creek Herd Unit in Relation to the Desolation Flats Project Area.

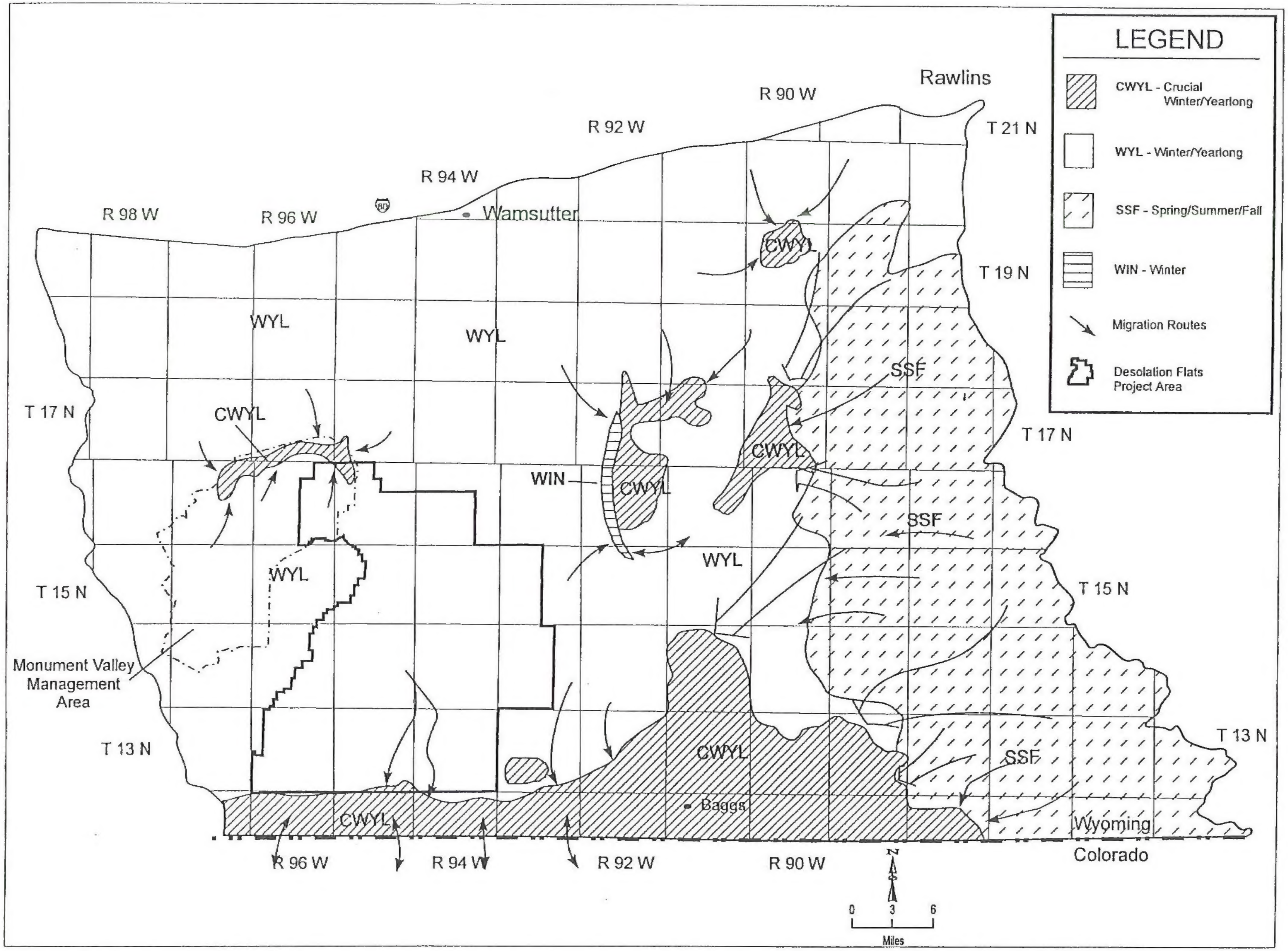


Figure 3-11. Seasonal Mule Deer Ranges for the Baggs Herd Unit in Relation to the Desolation Flats Project Area.

places this habitat type occurs on the project area are in the south-central portion along the Powder Rim and in the northwest in the Haystack range. The CWYL range near the Haystack Range (794 acres) is also located within the MVMA. Mule deer utilize several general migration routes to cross the project area and access the crucial winter ranges on Powder Rim and the Haystacks (Figure 3-11).

Elk. The DFPA is located within the southeastern quarter of the Petition Herd Unit (Figure 3-12). The Petition Elk Herd Unit is bounded by Wyoming Highway 430 on the west, Interstate 80 to the north, Wyoming Highway 789 to the east and the Colorado/Wyoming state line to the south and covers approximately 2,915 square miles.

The 1999 post hunt population estimate of 300 animals for the Petition Herd Unit (Table 3-20) is at the WGFD management objective. Since the herd has been thriving and numbers are stable, the WGFD proposed increasing the antlerless harvest and hunter opportunity for the 2000 hunting season. Population objectives can change over time and are based upon WGFD management and public input. The project area is located within Hunt Area 124, where hunter success rate for 1999 was 51.7 percent (WGFD 2000b).

The Petition Herd Unit contains yearlong (YL), WYL, and CWYL elk habitats as shown on Figure 3-12. Approximately 201,003 acres or 86.1 percent of the project area is not classified as elk habitat. Of the remaining 32,539 acres, 9,364 acres (4.0 %) are classified as YL; 21,302 acres (9.1%) are WYL; and 1,873 acres (0.8 %) are CWYL range. All of the winter range occurs in the area of the Powder Rim along the southern edge of the project area (Figure 3-12). No designated elk ranges occur on the MVMA. Elk migrate to the Powder Rim from the Sierra Madre and Elk Head Mountains (approximately 50 miles to the east) and may cross southern portions of the DFPA (Porter 1999).

White-tailed Deer. The WOS (WGFD 2000a) contains records of occurrences of white-tailed deer along the flood plain of the Little Snake River around Baggs, Wyoming. White-tailed deer habitats in the Northern Rocky Mountains can be generally characterized as dense coniferous forests, riparian areas, and croplands at elevations of 1,000 to 6,500 feet (Halls 1984). Habitats on the project area, however, are not typical of those normally inhabited by this species. White-tailed deer may occasionally traverse the project area along the riparian corridor vegetation found adjacent to dry stream beds as they move between riparian/bottomland habitats along the Little Snake River. There is only a slight possibility that white-tailed deer would occur on the DFPA. Due to the limited number of white-tailed deer within the Baggs Herd Unit, animal numbers are not managed through hunting (WGFD 2000b).

3.7.5 Wild Horses

The project area is located within portions of the RFO and RSFO administrative areas. Management direction for wild horses is outlined within the RMP's (USDI-BLM 1990a, USDI-BLM 1997). The RMP's provide for protection, management, and control of the wild horses within a number of Wild Horse Herd Management Areas (HMA). The DFPA lies within the bounds of the Adobe Town Wild Horse HMA (Figure 3-13).

Within each wild horse HMA, monitoring is conducted primarily at the allotment level and emphasizes vegetative conditions. Limited data has been gathered on the horses themselves, but

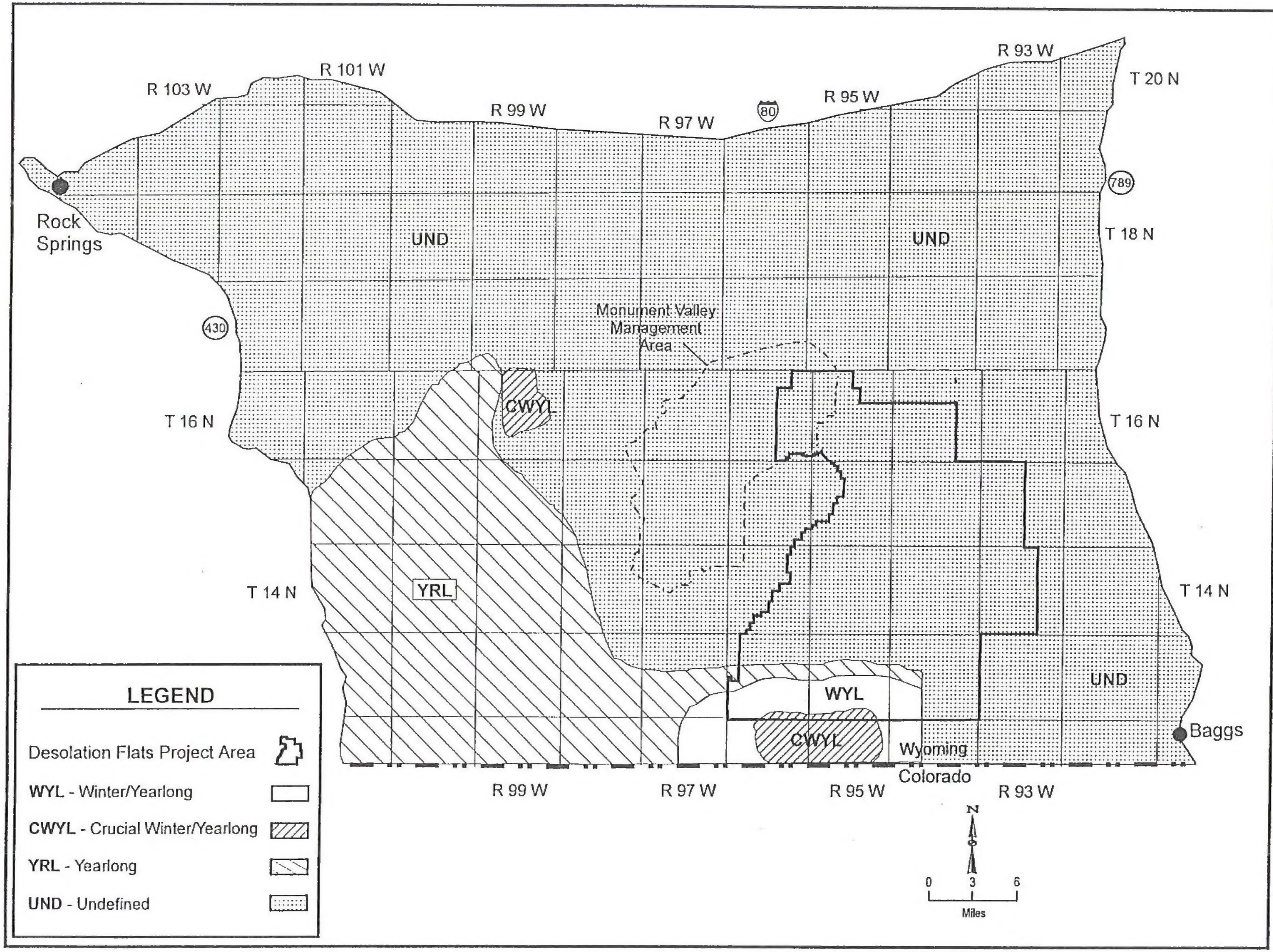


Figure 3-12. Seasonal Elk Ranges for the Petition Herd Unit in Relation to the Desolation Flats Project Area.

plans include developing a more extensive monitoring program to evaluate herd condition and ensure that objectives established in management plans are met (USDI-BLM 1999d).

The Adobe Town Wild Horse HMA is predominantly within the RFO administrative area and encompasses approximately 466,265 acres. The majority of the DFPA lies within the Adobe Town Wild Horse HMA (194,105 acres or 83.1%). Likewise, the majority of the MVMA is located within the Adobe Town Wild Horse HMA. The wild horse herd management target is about 700 horses, with a range of 610-800 in the Adobe Town Wild Horse HMA. The most recent BLM wild horse population estimate (2001) for the Adobe Town Wild Horse HMA was approximately 1,740 animals (Reed 2002). There is a large area of habitat currently used by a relatively small number of horses (179 in 2001) that is not located within the Adobe Town Wild Horse HMA (Figure 3-13). A small portion of the DFPA (16.3%) is located in this area. This area does not have a herd management goal, and horses in this area may be gathered and removed over time (USDI-BLM 1999d). If horses are distributed evenly across the Adobe Town Wild Horse HMA, we would expect approximately 291 horses to occur on the portion of the DFPA located within the Adobe Town Wild Horse HMA. However, horses are not likely evenly distributed because they will concentrate in areas of suitable habitat (i.e. near water sources), and will use different portions of the Wild Horse HMA during different seasons (Reed 2002).

3.7.6 Upland Game Birds

Two species of upland game birds are known to regularly use habitat within the project area: greater sage-grouse (*Centrocercus urophasianus*) and mourning dove (*Zeniada macroura*). The WGFD manages greater sage-grouse and other game birds within designated upland game management areas. The DFPA is located in the center of the southern half of the 1,758-square-mile Bitter Creek Upland Game Management Area (WGFD 2000c).

Greater Sage-grouse. Greater sage-grouse are common on the project area, and are know to inhabit the project area year-round (WGFD 2000a, HWA 2002). The entire project area occurs within the Bitter Creek Game Management Area where the grouse are managed by the WGFD. In 1999, 218 grouse, or 1.0 percent of the state wide annual harvest of 21,556 grouse, were killed within the Bitter Creek Game Management Area (WGFD 2000c).

Greater sage-grouse are listed as a state sensitive species by the BLM and may be petitioned for listing under the Endangered Species Act (ESA) because populations have been in decline over much of their range due to a wide variety of possible factors including drought, habitat loss, predation, and other causes. However, lek counts within the Green River region, which includes a portion of the DFPA, have increased during the past three years with more than twice as many males being counted on leks as were observed by WGFD during the low in the population during 1997 (Woolley 2000, personal communication).

Important habitats for these birds include strutting (leks), nesting, brood-rearing, and wintering areas, all of which occur on the project area both in contiguous blocks and in isolated patches (HWA 2002). During their spring mating season, greater sage-grouse gather on strutting grounds (leks) that typically occur in open or barren areas within a sagebrush matrix. Females usually nest within mature stands of sagebrush that provide adequate cover and protection from predators. Density of nesting greater sage-grouse tends to decrease with distance from the lek, with the majority of females nesting within 2 miles of leks (Braun et al. 1977, Hayden-Wing et al. 1986).

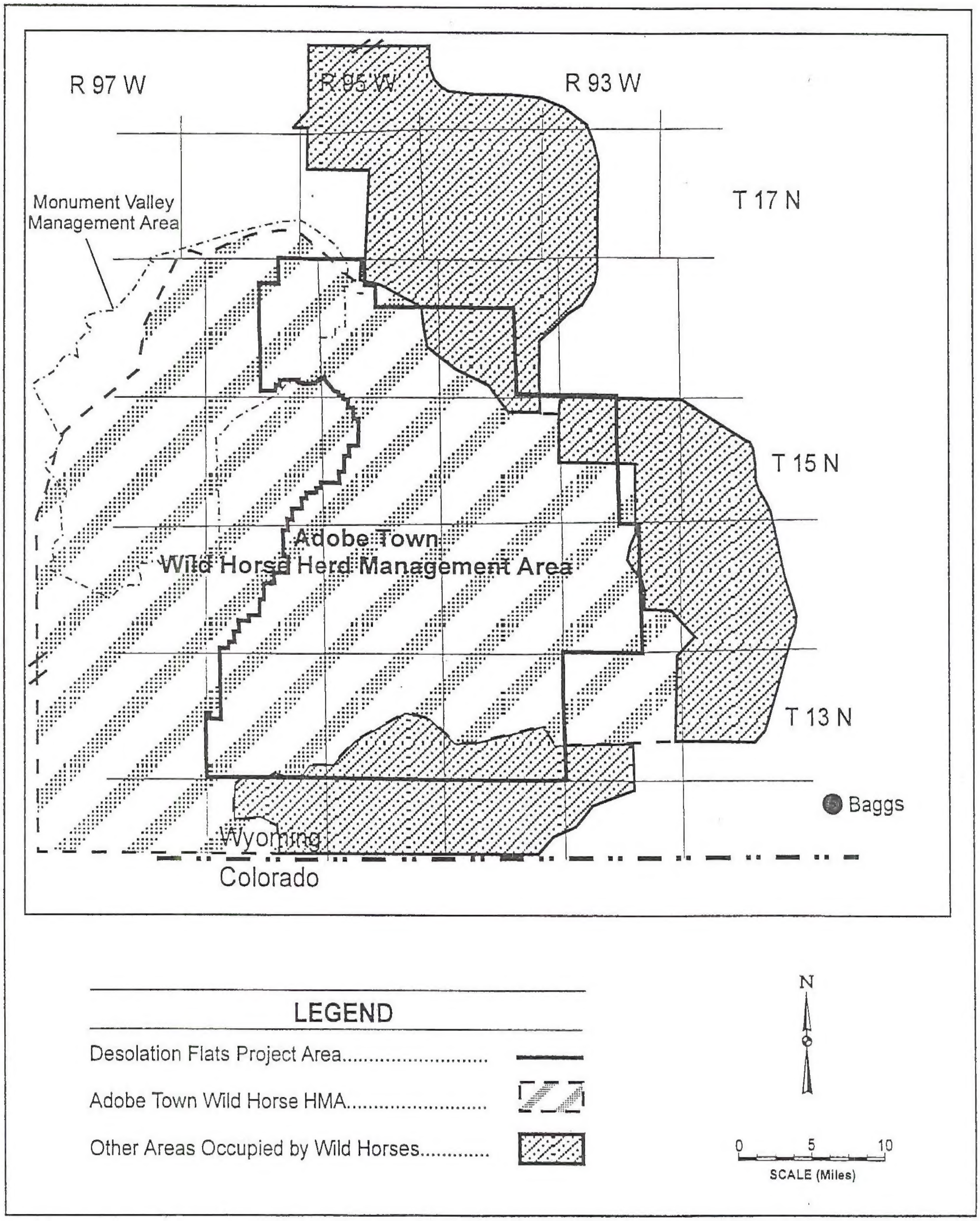


Figure 3-13. The Adobe Town Wild Horse Herd Management Area as it Relates to the Desolation Flats Project Area.

Therefore, habitat within 2 miles of leks is considered potential nesting habitat. Winter habitat is characterized by tall mature stands of sagebrush that remain above snow cover (HWA 2002).

Fifteen greater sage-grouse lek locations on and within two miles of the project area, were obtained through the BLM office in Rawlins, Wyoming and from District and Regional biologists with the WGFD in Baggs and Green River, Wyoming. Aerial surveys by HWA biologists were conducted in April, 2000 to check the status of known greater sage-grouse leks and document new leks on and within two-miles of the project area (HWA 2002). Locations of the four active leks found during the April, 2000 survey and two active leks that have been monitored by WGFD (Woolley, personal communication) are illustrated in Figure 3-14. In addition to the 15 leks obtained through BLM and WGFD records, one new active lek was discovered during aerial surveys, bringing the total lek count to 6 that were active during 2000 surveys and 10 that were not active. According to the WGFD, leks will not be considered historic until they have not been used for 7-10 years. It is probable that hens from the active leks use the project area for nesting and brood rearing. Greater sage-grouse leks and associated nesting habitats on the project area occur mostly within sagebrush/desert shrub vegetation type, and secondarily within the big sagebrush type (Figure 3-14). Only one greater sage-grouse lek (active or historic) was located within 2 miles of the MVMA. The winter of 2000-2001 was worse than most years on the project area and snow cover was extensive and deep. This forced greater sage-grouse to seek out habitat with sagebrush tall enough to remain above the deep snow. In order to determine the location of crucial winter habitats used by grouse during this extreme winter, HWA biologists conducted helicopter surveys during the maximum snow depth conditions that occurred in February, 2001 (HWA 2002). The areas where greater sage-grouse were found during the surveys were classified as severe winter relief habitats. Severe winter relief habitat is used only during the worst of winters, and allows at least a significant portion of the population to survive the occasional extremely severe winter. Most of the severe winter relief habitat for greater sage-grouse was found within the sagebrush/desert shrub type (Figure 3-14). The remainder was located within stands of tall big sagebrush that occur within other vegetation types. During April and May 2001, the severe winter relief habitat areas identified from the air were ground surveyed by HWA biologists to determine winter dropping densities of grouse and size of the areas used. Thirteen severe winter relief habitat patches were located on the DFPA, covering a total of 209 acres. No severe winter relief habitat patches were identified on the MVMA. Details of the protocol used in locating and describing the concentration areas are contained in the Technical Report (HWA 2002).

Mourning Dove. Both migratory and nesting populations of mourning doves have been recorded within the region and it is likely that they occur on the project area (WGFD 2000c). Mourning doves are frequently associated with sagebrush-steppe, mountain shrub, and riparian habitats. Brood production of the species is tied closely to spring and summer precipitation because increased productivity of mourning doves depends on the availability of sufficient seed and water supplies. Thus, mourning doves would be expected to concentrate along the riparian habitats within the project area.

The estimated 1999 dove harvest for the Bitter Creek Upland Game Management Area (Area 10) was 127 birds (WGFD 2000c) and accounted for about 0.4 percent of the statewide annual harvest of mourning doves (32,702) in 1999. The average harvest rate within Area 10 was 0.07 birds per square mile (WGFD 2000c). According to this average harvest rate, approximately 26 doves would theoretically have been harvested within the 365-square-mile project area during 1999.

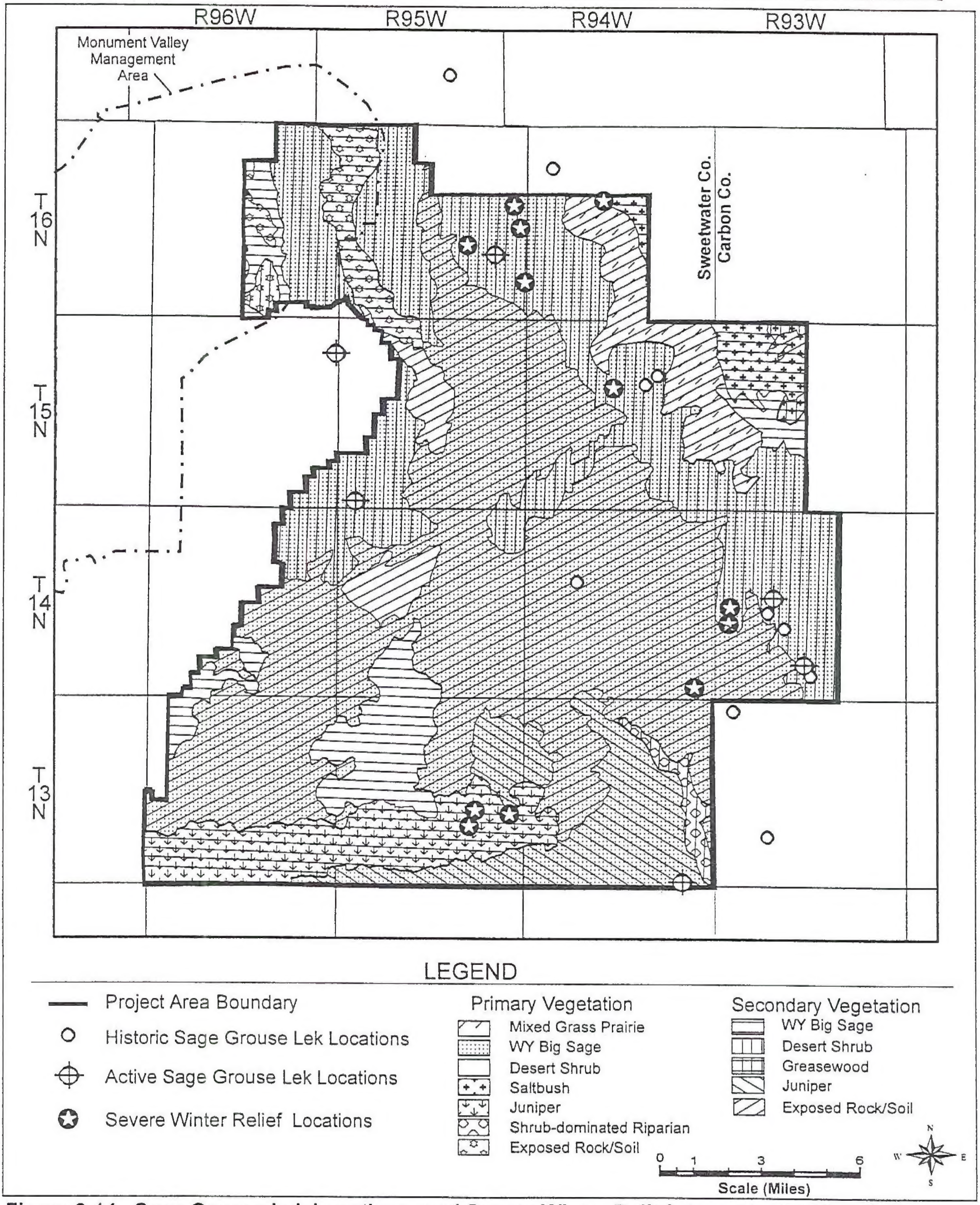


Figure 3-14. Sage Grouse Lek Locations, and Severe Winter Relief Areas in Relation to the Vegetative Cover of the Desolation Flats Project Area.

3.7.7 Raptors

Existing records of the WGFD and BLM, and recent research results from a raptor study conducted by Ayers and Anderson (1996), show that 17 species of raptors have been observed on the project area since 1977. The golden eagle (*Aquila chrysaetos*), bald eagle (*Haliaeetus leucocephalus*), red-tailed hawk (*Buteo jamaicensis*), ferruginous hawk (*Buteo regalis*), Cooper's hawk (*Accipiter cooperii*), Swainson's hawk (*Buteo swainsoni*), northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), prairie falcon (*Falco mexicanus*), burrowing owl (*Athene cunicularia*), and turkey vulture (*Carthartes aura*) are the most commonly reported raptors. Other raptor species which have been documented as occurring on the project area include: great horned owl (*Bubo virginianus*), long-eared owl (*Asio otus*), short-eared owl (*Asio flammeus*), rough-legged hawk (*Buteo lagopus*), sharp-shinned hawk (*Accipiter striatus*), and northern goshawk (*Accipiter gentilis*). Helicopter surveys of raptor nests on and around the project area were conducted by HWA during early May 2000 (HWA 2002). A total of 204 raptor nest sites was identified within a one-mile buffer of the DFPA between the May 2000 survey and BLM historic records (HWA 2002). Only nine of the nest sites were active. The active nest sites belonged to three raptor species: red-tailed hawk (3), ferruginous hawk (2), and golden eagle (4). Historic raptor nest locations within 1 mile of the DFPA (111 nests) were also obtained from the BLM. Only 8 raptor nest sites were located within the MVMA. Inactive raptor nest sites may be used in subsequent years, therefore, all nests have the potential to be active in any given year. The topography of the DFPA includes numerous low bluffs and cliffs that provide suitable sites for raptor nesting. The entire project area contains suitable habitat for raptor hunting or foraging.

3.8 SPECIAL STATUS PLANT, WILDLIFE, AND FISH SPECIES

Special status species include: (1) threatened, endangered, species proposed for listing by the FWS (Under the ESA of 1973 as amended); and (2) candidate species and sensitive species identified by the BLM Wyoming State Sensitive Species List (USDI-BLM 2001).

3.8.1 Threatened, Endangered or Proposed for Listing Species of Plants, Wildlife, and Fish

The FWS has determined that four wildlife, four fish, and one plant species listed as either threatened, endangered or proposed under the ESA may potentially be found in the project area or be affected by activities conducted on the project area (USDI-FWS 2002a). These species and their federal status under the ESA are listed in Table 3-21. More detailed information on threatened, endangered, and proposed species is presented in the Biological Assessment (BA) for the DFPA (USDI-BLM and HWA 2002).

3.8.1.1 Wildlife Species

Black-footed Ferret and Associated White-tailed Prairie Dog Colonies. The black-footed ferret's original distribution in North America closely corresponded to that of prairie dogs (Hall and Kelson 1959, Fagerstone 1987). In Wyoming, white-tailed prairie dog (*Cynomys leucurus*) colonies provide essential habitat for black-footed ferrets. Ferrets depend almost exclusively on prairie dogs for food and they also use prairie dog burrows for shelter, parturition, and raising their young (Hillman and Clark 1980, Fagerstone 1987).

Fifty-nine areas containing prairie dog burrows (Figure 3-15) were documented during aerial surveys conducted over the DFPA, plus the two-mile buffer, in April, 2000 (USDI-BLM and HWA

Table 3-21. Threatened, Endangered, and Proposed Wildlife, Fish, and Plant Species Potentially Present in the DFPA.[1]

Species	Scientific Name	Status
Mammals		
Black-footed ferret	*Mustela nigripes*	Endangered
Canada lynx	*Lynx canadensis*	Threatened
Birds		
Bald eagle	*Haliaeetus leucocephalus*	Threatened
Mountain plover	*Charadrus montanus*	Proposed
Fish		
Bonytail	*Gila elegans*	Endangered
Colorado pikeminnow	*Ptychocheilus lucius*	Endangered
Humpback chub	*Gila cypha*	Endangered
Razorback sucker	*Xyrauchen texanus*	Endangered
Plants		
Ute ladies'-tresses	*Spiranthes diluvialis*	Threatened

[1] Source: (USDI-FWS 2002a)

2002). Prairie dog towns occurring within the project area and the 2-mile buffer were mapped from the ground in their entirety. One prairie dog colony extended beyond the 2-mile buffer zone. Collectively, a total of 9,967 acres of white-tailed prairie dog colonies were identified (2.6 % of the surveyed area). A large portion of these colonies, 4,229 acres, was located outside of the DFPA. These colonies form 2 complexes (Figure 3-15) that may have the potential to support black-footed ferrets, according to habitat requirements identified in Biggins et al. (1989). Complex 1 encompasses 54 colonies and 9,450 acres and extends just beyond the 2-mile buffer of the project area. Complex 2 encompasses 5 colonies and 517 acres. Of the 59 colonies identified by air and surveyed on the ground, 9 colonies had active burrow densities less than 8 per acre and 43 colonies had active burrow densities greater than or equal to 8 per acre (USDI-BLM and HWA 2002). Black-footed ferret surveys would be necessary prior to ground disturbing activities within prairie dog towns in both complexes that meet FWS requirements for black-footed ferret surveys (USDI-FWS 1989). Portions of 4 colonies in complex 2 were located within the western portion of the MVMA located within the DFPA. Aerial mapping and ground surveys indicated that the area and density of active prairie dog colonies may be sufficient to support black-footed ferrets and that the species could theoretically be present within the DFPA.

No black-footed ferret sightings within the project area have been reported in the Wildlife Observation System (WOS), WYNDD, or records of the BLM (WGFD 2000a, WYNDD 2000, and Jim Dunder, Wildlife Biologist, Rock Springs Field Office, personal communication). The WGFD atlas does, however, indicate that historic sightings of black-footed ferrets have been made within the project area (WGFD 1999) and an unconfirmed sighting of a black-footed ferret southwest of Monument Valley was reported in 1992 (Jim Dunder, personal communication).

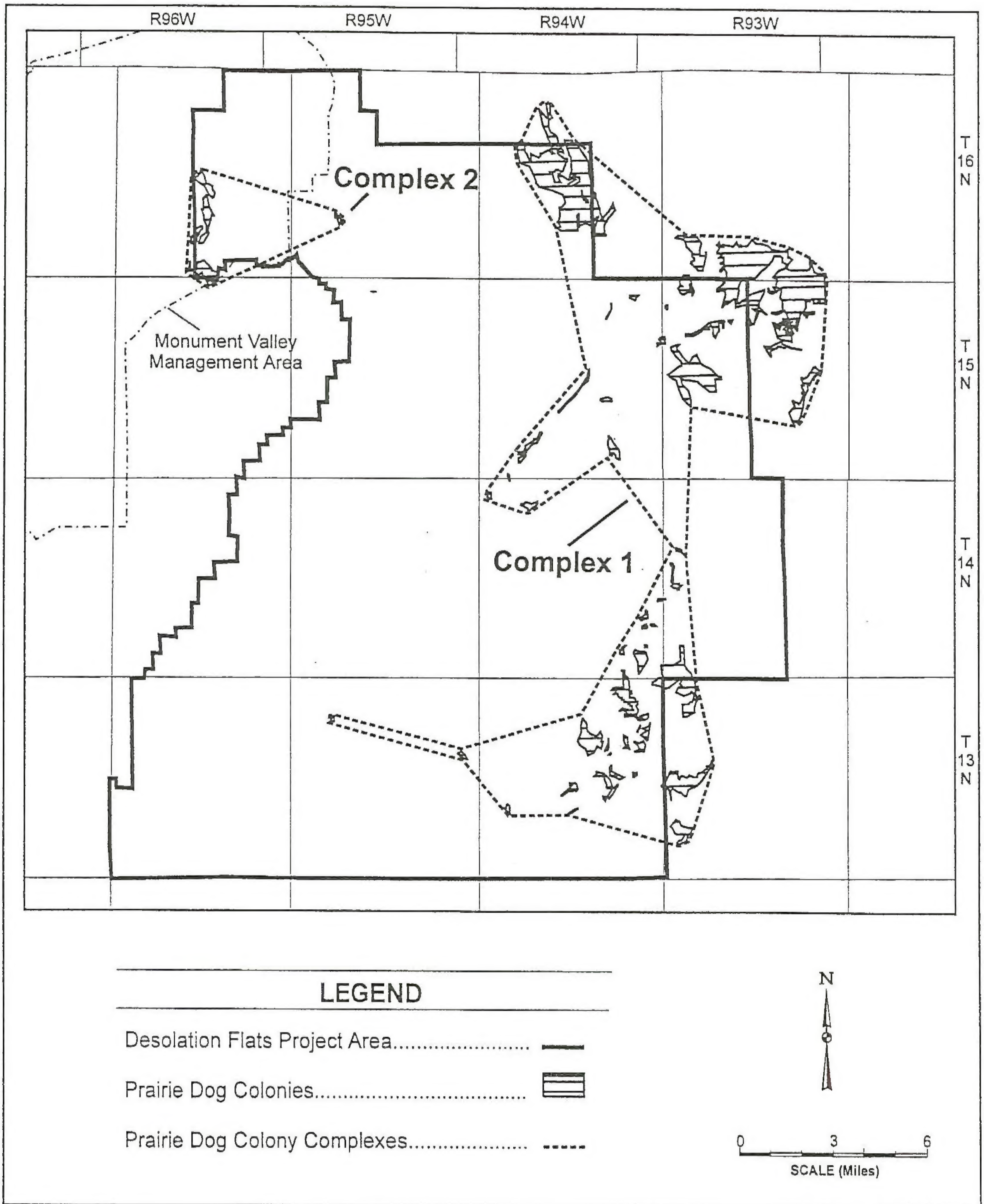


Figure 3-15. White-tailed Prairie Dog Colonies and Complexes in Relation to the Desolation Flats Project Area.

Canada Lynx. The Canada lynx is one of three major species of wildcats found in North America. Although Wyoming comprises part of the species' historic geographical range, no lynx sightings have been documented in the project area or within a six-mile buffer (WGFD 2000a). In a collaborative effort, the BLM, FWS, and FS recently completed a map of lynx habitat in the State of Wyoming; according to the habitat map, lands within the DFPA do not provide lynx habitat (McKelvey et al. 1999), but lynx could potentially travel across the DFPA.

Due to the facts that: (1) the project area does not include high elevation lodgepole pine/spruce-fir habitat types preferred by this species, (2) the project area does not support a population of snowshoe hares (WGFD 2000a), (3) there are no recorded lynx sightings within a six-mile buffer in either the WOS (WGFD 2000a) or the WYNDD (2000), and (4) the closest potential habitat is more than 20 miles to the east in the Sierra Madre Mountains, it is unlikely that lynx occur on or near the project area.

Bald Eagle. As of the July 12, 1995 Federal Register, the bald eagle is no longer classified as endangered and has been downlisted by the FWS to the status of threatened in the lower 48 states. Bald eagles typically build stick nests in the tops of coniferous or deciduous trees along streams, rivers or lakes; they may also select cliffs and ledges as nest substrates (Call 1978). Selection of nest trees appears to depend, in part, on food availability early in the nesting season (Swenson et al. 1986). Primary wintering areas are typically associated with concentrations of food sources along major rivers that remain unfrozen where fish and waterfowl are available and near ungulate winter ranges that provide carrion (Montana Bald Eagle Working Group 1990). Wintering bald eagles are also known to roost in forests with large, open conifers and snags protected from winds by ridges, often near concentrations of domestic sheep and big game (Anderson and Patterson 1988).

Bald eagles winter and nest in proximity to the project area along the Little Snake River, and numerous observations, both on and proximal to the project area, are listed in the WOS (WGFD 2000a). A large number of incidental bald eagle sightings (70) have been recorded within a six-mile buffer of the project area (WGFD 2000a). Most observations (91 %) were documented between November and March, indicating that the area is primarily used as wintering habitat.

Several ecological factors probably allow for seasonal and/or year-round use by bald eagles along the Little Snake River: (1) water remains open on the river year-round providing an adequate supply of fish and waterfowl, (2) the river is adjacent to crucial ungulate winter range, (3) domestic sheep production is present, and (4) the riparian zone has many large cottonwood trees for roosting and nesting. This habitat located along the Little Snake River is located outside of the 1-mile buffer of the DFPA. Upland habitat use by bald eagles within the project area would probably be limited to winter scavenging forays. Very few, if any, trees large enough for eagle roosting or nesting exist on the project area.

Inspection of BLM and WGFD raptor nest records and results of aerial and ground raptor nest surveys (HWA 2002) revealed that no active bald eagle nests occurred within the DFPA.

Mountain Plover. The mountain plover nests across much of Wyoming, but preferred habitat is limited throughout its range (Oakleaf et al. 1982, Dinsmore 1983, Leachman and Osmundson 1990). This ground-nesting species is typically found in areas of short (less than four inches) vegetation on slopes of less than three percent. Any short grass, very short shrub, or cushion plant community could be considered plover nesting habitat (Parrish et al. 1993), however, mountain plovers prefer shortgrass prairie with open, level or slightly rolling areas dominated by blue grama

and buffalograss (Graul 1975, Dinsmore 1981, Dinsmore 1983, Kantrud and Kologiski 1982). These habitats are quite often associated with prairie dog colonies, and researchers have found that plovers use prairie dog colonies more often than other areas (Knowles et al. 1982, Knowles and Knowles 1984, Olson and Edge 1985).

The DFPA was surveyed for mountain plovers and mountain plover habitat in June, 2000 (USDI-BLM and HWA 2002). Plover habitat evaluations were conducted in accordance with the protocol outlined in the *Final Biological and Conference Opinions for the Proposed Continental Divide/Wamsutter II Natural Gas Project* (USDI-FWS 2000). Potential plover habitats defined during 2000 were again surveyed for plovers in 2001. The project area provides approximately 25,415 acres (10.9 % of the project area) of potential plover habitat (USDI-BLM and HWA 2002). Approximately 4,825 acres of this potential mountain plover habitat was located within the MVMA. Some "islands" of non-habitat such as dense sagebrush are included within the greater polygons of designated plover habitat, however plover are capable of utilizing relatively small habitat patches within a sagebrush matrix.

Mountain plovers were observed in numerous locations in the northern half of the DFPA, including the MVMA. There are also recorded sightings of mountain plovers within a six-mile buffer of the project area (WGFD 2000a, WYNDD 2000). During 2000 and 2001 surveys, mountain plovers were observed within 9,202 acres (3.9% of the project area) of the designated potential mountain plover habitat polygons; none were observed in the remaining 16,213 acres of designated potential mountain plover habitat (Figure 3-16). Plovers with young were found on one site (Section 4, T15N:R93W) during the 2001 production survey.

3.8.1.2 Fish Species

The DFPA drains intermittent/ephemeral runoff generated by spring snowmelt and summer thunderstorm events directly into the Little Snake River, a tributary to the Colorado River. Surface water is scarce and perennial streams within the DFPA are limited to the most downstream portion of the Sand Creek drainage during wet years (see Section 3.4.2.1). All of the streams in the project area are classified as Class 5 streams by the WGFD (1991).

Four federally endangered fish species may occur as downstream residents of the Colorado River system: bonytail (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), and razorback sucker (*Xyrauchen texanus*) (USDI-FWS 2002a). The bonytail, Colorado pikeminnow, humpback chub, and razorback sucker share similar habitat requirements and historically have occupied the same rivers. None of these fish species are likely to be found in streams within the DFPA, nor has critical habitat been established in Wyoming for any of these species (Upper Colorado River Endangered Fish Recovery Program 1999). However, the potential for project-related impacts to waters (see section 4.4) that feed into the Little Snake River warrant their inclusion in this NEPA document.

<u>Colorado Pikeminnow</u>. The Colorado pikeminnow is the largest member of the minnow family and occurs in swift, warm waters of Colorado Basin rivers. The species was once abundant in the main stem of the Colorado River and most of its major tributaries throughout Wyoming, Colorado, Utah, New Mexico, Arizona, Nevada, California, and Mexico. It was also known to occur historically in the Green River of Wyoming at least as far north as the City of Green River. In 1990, one adult was collected from the Little Snake River in Carbon County, Wyoming (Baxter and Stone 1995).

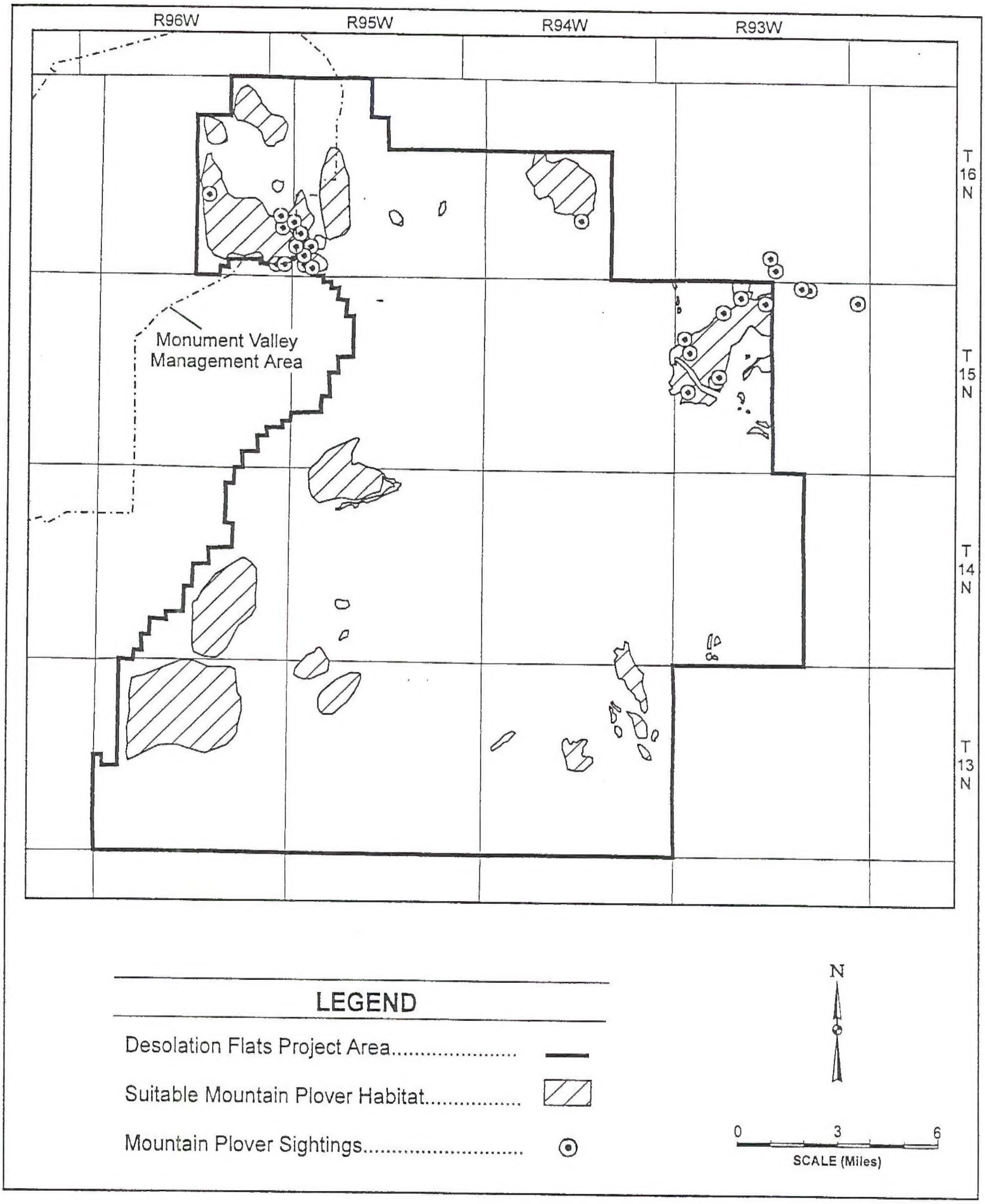


Figure 3-16. Areas Identified as Potential Mountain Plover Habitat and Mountain Plover Sightings on and proximal to the Desolation Flats Project Area.

Subsequent survey attempts to collect Colorado pikeminnow from this area of the Little Snake River by WGFD personnel failed to yield any other specimens.

Bonytail. Habitat of the bonytail is primarily limited to narrow, deep, canyon-bound rivers with swift currents and white water areas. With no known reproducing populations in the wild today, the bonytail is thought to be the rarest of the endangered fishes in the Colorado River Basin. The bonytail was historically found in portions of the upper and lower Colorado River basins. Today, in the upper Colorado River Basin, only small, disjunct populations of bonytail are thought to exist in the Yampa River in Dinosaur National Monument, in the Green River at Desolation and Gray canyons, in the Colorado River at the Colorado/Utah border and in Cataract Canyon (Upper Colorado River Endangered Fish Recovery Program 1999).

Humpback Chub. Habitat of the humpback chub is also limited to narrow, deep, canyon-bound rivers with swift currents and white water areas (Valdez and Clemmer 1982, Archer et al. 1985, Upper Colorado River Endangered Fish Recovery Program 1999). The humpback chub was historically found throughout the Colorado River, and its tributaries, which are used for spawning (Valdez et al. 2000). It is estimated that the humpback chub currently occupies 68% of its original distribution, in five independent populations that are thought to be stable (Valdez et al. 2000).

Razorback Sucker. The razorback sucker, an omnivorous bottom feeder, is one of the largest fishes in the sucker family. Adult razorback sucker habitat use varies depending on season and location. This species was once widespread throughout most of the Colorado River Basin from Wyoming to Mexico. Today, in the upper Colorado River Basin, populations of razorback suckers are only found in the upper Green River in Utah, the lower Yampa River in Colorado and occasionally in the Colorado River near Grand Junction (Upper Colorado River Endangered Fish Recovery Program 1999).

3.8.1.3 Plant Species

Ute ladies'-tresses. The Ute ladies'-tresses is a perennial, terrestrial orchid, endemic to moist soils near wetland meadows, springs, lakes, and perennial streams. It occurs generally in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows at elevations from 4,200 to 7,000 feet. The orchid colonizes early successional riparian habitats such as point bars, sand bars, and low lying gravelly, sandy, or cobbly edges, persisting in those areas where the hydrology provides continual dampness in the root zone through the growing season. Recent discoveries of orchid colonies in Wyoming and Montana indicate that surveys for and inventories of orchid occurrences continue to be an important part of orchid recovery planning and implementation (USDI-FWS 2002a). This species has been located in Converse, Goshen, Laramie, and Niobrara counties in Wyoming (Fertig 2000).

3.8.2 Sensitive Plant, Wildlife, and Fish Species

Although these species have no legal protection under the ESA, the BLM and FWS still maintain an active interest in their numbers and status. Sensitive species are those included on the BLM Wyoming State sensitive species list (USDI-BLM 2001). The BLM views "management of sensitive species as an opportunity to practice pro-active conservation; this management should not be onerous, or a show-stopper of other legitimate, multiple use activities" (USDI-BLM 2001). The BLM's order of priority for the management of all special status species is: First - listed T&E species; Second - proposed T&E species; Third - candidate T&E species; Fourth - BLM sensitive species; and, Fifth - State listed species (USDI-BLM 2001). The BLM Wyoming Sensitive Species

list is meant to be dynamic, and the list will be reviewed annually. The plant, wildlife, and fish species and their sensitivity status/rank are listed in Table 3-22. A summary discussion of these species follows and detailed species accounts and discussion for wildlife and fish species are included in the Wildlife and Fisheries Technical Report (HWA 2002). The potential for occurrence of the following sensitive species in the MVMA portion of the DFPA is expected to be the same as for the remainder of the DFPA.

Plants. Twenty-one BLM Wyoming state sensitive plant species are found in either the BLM Rawlins Field Office or Rock Springs Field Office (USDI-BLM 2001). These include: meadow pussytoes, Laramie columbine, small rock cress, mystery wormwood, Nelson's milkvetch, precocious milkvetch, Cedar Rim thistle, Ownbey's thistle, Wyoming tansymustard, Weber's scarlet gilia, large-fruited bladderpod, stemless beardtongue, Gibbens' beardtongue, Beaver Rim phlox, tufted twinpod, persistent sepal yellowcress, pale blue-eyed grass, Laramie false sagebrush, Green River greenthread, Uinta greenthread, and Cedar Mountain Easter daisy. One of these, Gibbens' beardtongue (Penstemon gibbensii), is known to occur in the eastern portion of the DFPA (WYNDD 2002). The occurrence and distribution of these species will require specific consideration in the planning of the proposed project as discussed in Chapter 4. A summary of status and habitat associations for these sensitive species is given in Table 3-22.

Mammals. Ten sensitive mammal species may potentially be found on the DFPA. These include: dwarf shrew, Idaho pocket gopher, Wyoming pocket gopher, pygmy rabbit, white-tailed prairie dog, swift fox, spotted bat, fringed myotis, long-eared myotis, and Townsend's big-eared bat. Only one of these species, the white-tailed prairie dog is known to occur on the DFPA. The dwarf shrew, Wyoming pocket gopher, and swift fox are likely to occur on the DFPA. The Idaho pocket gopher is unlikely to occur and the remaining species: pygmy rabbit, spotted bat, fringed myotis, long-eared myotis, and Townsend's big-eared bat, have a slight potential to occur on the DFPA.

Birds. Fifteen sensitive bird species may potentially be found on the DFPA. These include: Baird's sparrow, sage sparrow, Brewer's sparrow, long-billed curlew, sage thrasher, western burrowing owl, yellow-billed cuckoo, loggerhead shrike, Columbian sharp-tailed grouse, greater sage-grouse, white-faced ibis, trumpeter swan, peregrine falcon, ferruginous hawk, and northern goshawk. The western subspecies of yellow-billed cuckoo is considered a FWS candidate for listing as endangered. Nine of these species are known to be present on the DFPA and include: sage sparrow, Brewer's sparrow, sage thrasher, western burrowing owl, Scott's oriole (not likely to nest on the DFPA, though), loggerhead shrike, greater sage-grouse (see Section 3.7.6), ferruginous hawk, and northern goshawk (not likely to nest on the DFPA, though). Seven species, snowy plover, Baird's sparrow, long-billed curlew, yellow-billed cuckoo, black tern, white-faced ibis, and trumpeter swan, are unlikely to occur. The Columbian sharp-tailed grouse and peregrine falcon have a slight potential to occur in the DFPA.

Reptiles. The midget-faded rattlesnake may potentially be found on the DFPA, but the likelihood is very low.

Amphibians. Four sensitive amphibian species may potentially be found on the DFPA. These include: boreal toad, Great Basin spadefoot toad, northern leopard frog, and spotted frog. The boreal toad and spotted frog are unlikely to occur on the DFPA, the Great Basin spadefoot toad has a slight potential to occur, and the northern leopard frog is likely to occur in areas with perennial water.

Table 3-22. Sensitive Plant, Wildlife, and Fish Species Potentially Present in the DFPA.[1]

Plant Species				
Common Name	**Scientific Name**	**Sensitivity**	**Habitat**	**Occurrence Potential[3]**
Meadow pussytoes	*Antennaria arcuata*	GS/S2	Moist, hummocky meadows, seeps or springs surrounded by sage/grasslands 4,950-7,900'	unlikely
Laramie columbine	*Aquilegia laramiensis*	G2/S2, FSR2	Crevices of granite boulders and cliffs, 6,400-8,000'	unlikely
Small rock cress	*Arabis pusilla*	G1/S1 Removed from Federal Candidate list 10/25/99	Cracks/crevices in sparsely vegetated granite/pegmalile outcrops within sage/grasslands 8,000-8,100'	unlikely
Mystery wormwood	*Artemisia biennis var. diffusa*	G5T1/S1	Clay flats and playas 6,500'	possible
Nelson's milkvetch	*Astragalus nelsonianus*	G2/S2 CO	Alkaline clay flats, shale bluffs and gullies, pebbly slopes, and volcanic cinders in sparsely vegetated sagebrush, juniper, and cushion plant communities at 5,200-7,600'	possible
Precocious milkvetch	*Astragalus proimanthus*	G1/S1, BLM	Cushion plant communities on rocky, clay soils mixed with shale on summits and slopes of white shale hills at 6,800-7,200 feet.	unlikely
Cedar Rim thistle	*Cirsium aridum*	G2Q/S2	Barren, chalky hills, gravelly slopes and fine textured, sandy-shaley draws 6,700-7.200'	possible
Ownbe's thistle	*Cirsium ownbeyi*	G3/S2	Sparsely vegetated shaley slopes in sage and juniper communities 6,440-8,400;	possible
Wyoming tanseymustard	*Descurania torulosa*	G1/S1	Sparsely vegetated sandy slopes at base of cliffs of volcanic breccia or sandstone 8,300-10,000'	possible
Weber's scarlet gilia	*Ipomopsis aggregata ssp. weberi*	G5T1T2Q/S1,FSR2	Openings in coniferous forests and scrub oak woodlands 8,500-9,600'	unlikely
Large-fruited bladderpod	*Lesquerella macrocarpa*	G2/S2	Gypsum-clay hills and benches, clay flats, and barren hills 7,200-7,700'	possible
Stemless beardtongue	*Penstemon acaulis var. acaulis*	G3T2/S1	Cushion plant or Black sage grassland communities on semi-barren rocky ridges, knolls, and slopes at 5,900-8,200'	possible
Gibbens' beardtongue	*Penstemon gibbensii*	G1, S1, BLM	Sandy or shaley (often Green River Shale) bluffs and slopes, 5,500-7,500 ft. Associated vegetation: *Juniperus* spp., *Cirsium* spp., *Eriogonum* spp., *Elymus* spp., *Amelanchier alnifolia*, *Chrysothamnus* spp., *Thermopsis* spp., *Arenaria* spp., and *Astragalus* spp.	certain, within eastern portion of project
Beaver Rim phlox	*Phlox pungens*	G2/S2	Sparsely vegetated slopes on sandstone, siltstone, or limestone substrates 6,000-7,400'	unlikely
Tufted twinpod	*Physaria condensata*	G2/S2	Sparsely vegetated shale slopes and ridges 6,500-7,000"	unlikely
Persistent sepal yellowcress	*Rorippa calycina*	G3/S2S3	Riverbanks and shorelines, usually on sand soils near high water line	unlikely
pale blue-eyed grass	*Sisyrinchium pallidum*	G2G3/S2S3	Wet meadows, stream banks, roadside ditches, and irrigated meadows, 7,000-7,900'	unlikely

Table 3-22. Continued.

Laramie false sagebrush	*Sphaeromeria simplex*	G2/S2	Cushion plant communities on rocky limestone ridges and gentle slopes 7,500 - 8600'	unlikely
Green River greenthread	*Thelesperma caespitosum*	G1/S1	White shale slopes and ridges of Green River Formation 6,300'	possible
Uinta greenthread	*Thelesperma pubescens*	G1/S1	Sparsely vegetated benches and ridges on course, cobbly soils of Bishop Conglomerate 8,200-8,900"	possible
Cedar Mountain Easter daisy	*Townsendia mircrocephala*	G1/S1	Rocky slopes of Bishop Conglomerate 8,500'	possible

Wildlife Species

Common Name	Scientific Name	Sensitivity Status[2]	Occurrence Potential[3]
Mammals			
Dwarf shrew	*Sorex nanus*	G4/S2S3, R2, NSS3	Likely
Idaho pocket gopher	*Thomomys idahoensis*	G4/S2?, NSS5	Unlikely
Wyoming pocket gopher	*Thomomys clusius*	R2, G2/S1S2, NSS4	Likely
Pygmy rabbit	*Brachylagus idahoensis*	G4/S2, NSS3	Possible
White-tailed prairie dog	*Cynomys leucurus*	G4/S2S3, NSS7	Present
Swift fox	*Vulpes velox*	R2, G2/S2S3, NSS3	Likely
Spotted bat	*Euderma maculatum*	R2/R4,G4/S1B, SZ?N, NSS2	Possible
Fringed myotis	*Myotis thysanodes*	R2, G5/S1B, S1N, NSS2	Possible
Long-eared myotis	*Myotis evotis*	G5/S1B, S1?N, NSS2	Possible
Townsend's big-eared bat	*Corynorhinus townsendii*	R2/R4, G4/S1B, S2N, NSS2	Possible
Birds			
Baird's sparrow	*Ammodramus bairdii*	G4/S1B, SZN, R2, NSS4	Unlikely
Sage sparrow	*Amphispiza belli*	G5/S3B, SZN	Present
Brewer's sparrow	*Spizella breweri*	G5/S3B, SZN	Present
Long-billed curlew	*Numenius americanus*	G5/S3B, SZNR2, NSS3	Unlikely
Sage thrasher	*Oreoscoptes montanus*	G5/S3B, SZN	Present
Western burrowing owl	*Athene cunicularia*	R2, G4/S3B, SZN, NSS4	Present
Yellow-billed cuckoo	*Coccyzus americanus*	G5/S2B, SZN, R2, NSS2	Unlikely
Loggerhead shrike	*Lanius ludovicianus*	G5/S4B, SZN, R2	Present
Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	R2/R4, G4T3/S1	Possible
Greater sage-grouse	*Centrocercus urophasianus*	G5/S3	Present
White-faced ibis	*Plegadis chihi*	G5/S1B, SZN, R2, NSS3	Unlikely
Trumpeter swan	*Cygnus buccinator*	R2/R4, G4/S1B, S2N, NSS2	Unlikely
Peregrine falcon	*Falco peregrinus*	G4/T3/S1B, S2N, R2, NSS3	Possible
Ferruginous hawk	*Buteo regalis*	R2, G5/S23B, S4N, NSS3	Present
Northern goshawk	*Accipiter gentilis*	R2/R4, G5/S23B, S4N, NSS4	Present
Reptiles			
Midget-faded rattlesnake	*Crotalus viridis concolor*	G5T3/S1S2	Possible
Amphibians			
Boreal toad	*Bufo boreas boreas*	G4T4/S2, R2, R4, NSS1	Unlikely
Great Basin spadefoot toad	*Spea intermontanus*	G5/S4, NSS4	Possible
Northern leopard frog	*Rana pipiens*	G5/S3, R2, NSS4	Likely
Spotted frog	*Rana pretiosa*	G4/S2S3, R2, R4, NSS4	Unlikely
Fish			
Leatherside chub	*Gila copei*	G3G4/S2, NSS1	Unlikely
Roundtail chub	*Gila robusta*	G3G4/S2?, NSS1	Unlikely
Bluehead sucker	*Catostomus discobolus*	G4/S2S3, NSS1	Unlikely
Flannelmouth sucker	*Catostomus latipinnis*	G3G4/S3, NSS1	Unlikely
Colorado River cutthroat trout	*Oncorhynchus clarki pleuriticus*	R2/R4, G4T2T3/S2, NSS2	Unlikely

Table 3-22. Continued.

[1] - Source: Fertig et al. (1994), WYNDD (2002), Dorn (2001), USDI-BLM (2001).
[2] - Definition of status

G Global rank: Rank refers to the range-wide status of a species.
T Trinomial rank: Rank refers to the range-wide status of a subspecies or variety.
S State rank: Rank refers to the status of the taxon (species or subspecies) in Wyoming. State ranks differ from state to state.
1 Critically imperiled because of extreme rarity (often known from 5 or fewer extant occurrences or very few remaining individuals) or because some factor of a species' life history makes it vulnerable to extinction.
2 Imperiled because of rarity (often known from 6-20 occurrences) or because of factors demonstrably making a species vulnerable to extinction.
3 Rare or local throughout its range or found locally in a restricted range (usually known from 21-100 occurrences).
4 Apparently secure, although the species may be quite rare in parts of its range, especially at the periphery.
5 Demonstrably secure, although the species may be rare in parts of its range, especially at the periphery.
H Known only from historical records. 1950 is the cutoff for plants; 1970 is the cutoff date for animals.
X Believed to be extinct.
A Accidental or vagrant: A taxon that is not known to regularly breed in the state or which appears very infrequently (typically refers to birds and bats).
B Breeding rank: A state rank modifier indicating the status of a migratory species during the breeding season (used mostly for migratory birds and bats)
N Nonbreeding rank: A state rank modifier indicating the status of a migratory species during the non-breeding season (used mostly for migratory birds and bats)
ZN or ZB Taxa that are not of significant concern in Wyoming during breeding (ZB) or non-breeding (ZN) seasons. Such taxa often are not encountered in the same locations from year to year.
U Possibly in peril, but status uncertain; more information is needed.
Q Questions exist regarding the taxonomic validity of a species, subspecies, or variety.
? Questions exist regarding the assigned G, T, or S rank of a taxon.

<u>WGFD Native Species Status Codes - Fish and Amphibians</u>

NSS1 - Populations are physically isolated and/or exist at extremely low densities throughout range. Habitats are declining or vulnerable. Extirpation appears possible. The Wyoming Game and Fish Commission mitigation category for Status 1 species is "Vital". The mitigation objective for this resource category is to realize "no loss of habitat function". Under these guidelines, it will be very important that the project be conducted in a manner that avoids alteration of habitat function.
NSS2 - Populations are physically isolated and/or exist at extremely low densities throughout range. Habitat conditions appear to be stable. The Wyoming Game and Fish Commission mitigation category for Status 2 species is also "Vital". The mitigation objective for this resource category is to realize "no loss of habitat function". Under these guidelines, it will be very important that the project be conducted in a manner that avoids alteration of habitat function.
NSS3 - Populations are widely distributed throughout its native range and appear stable. However, habitats are declining or vulnerable. The Wyoming Game and Fish Commission mitigation category for Status 3 species is "High". The mitigation objective for this resource category is to realize "no net loss of habitat function within the biological community which encompasses the project site". Under these guidelines, it will be important that the project be conducted in a manner that either avoids the impact, enhances similar habitat or results in the creation of an equal amount of similarly valued fishery habitat.
NSS4-7 - Populations are widely distributed throughout native range and are stable or expanding. Habitats are also stable. There is no special concern for these species.

<u>WGFD Native Species Status Codes - Birds and Mammals</u>

NSS1 - Populations are greatly restricted or declining, extirpation appears possible. AND On-going significant loss of habitat.
NSS2 - Populations are declining, extirpation appears possible; habitat is restricted or vulnerable but no recent or on-going significant loss; species may be sensitive to human disturbance. OR Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; ongoing significant loss of habitat.
NSS3 - Populations are greatly restricted or declining, extirpation appears possible; habitat is not restricted, vulnerable but no loss; species is not sensitive to human disturbance. OR Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; habitat is restricted or vulnerable but no recent or on-going significant loss; species may be sensitive to human disturbance. OR Species is widely distributed; population status or trends are unknown but are suspected to be stable; on-going significant loss of habitat.
NSS4 - Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; habitat is not restricted, vulnerable but no loss; species is not sensitive to human disturbance. OR Species is widely distributed, population status or trends are unknown but are suspected to be stable; habitat is restricted or vulnerable but no recent or on-going significant loss; species may be sensitive to human disturbance.
NSS5 - Populations are declining or restricted in numbers and/or distribution, extirpation is not imminent; habitat is stable and not restricted. OR Species is widely distributed, population status or trends are unknown but are suspected to be stable; habitat is not restricted, vulnerable but no loss; species is not sensitive to human disturbance.
NSS6 - Species is widely distributed, population status or trends are unknown but are suspected to be stable; habitat is stable and not restricted.
NSS7 - Populations are stable or increasing and not restricted in numbers and/or distribution; habitat is stable and not restricted.

[3] - Occurrence potential based upon presence of habitat and known distribution.

Fish. Five sensitive fish species may potentially be found on or downstream of the DFPA. These include: leatherside chub, roundtail chub, bluehead sucker, flannelmouth sucker, and Colorado River cutthroat trout. These species are unlikely to occur on the DFPA due to a lack of suitable habitat. However, they do occur downstream of the DFPA and are therefore considered in this document.

3.9 RECREATION

Recreation use of BLM, state, and private lands within the DFPA is best characterized as dispersed; there are no developed recreation sites or facilities. Most recreation activities occur during the fall hunting seasons. The area attracts small game hunters in September and October during the sage grouse season. Pronghorn hunting also occurs in September. Other hunting use occurs during the mule deer season in mid to late October and hunting for rabbits and predators later in the fall and winter. During other seasons the area attracts small numbers of recreationists engaged in rock collecting, camping and hiking, wild horse and wildlife observation, outdoor photography and picnicking. The area also accommodates a limited amount of use by off-road vehicle enthusiasts. Although statistical data on recreational visitation are not available, overall use levels are generally low (USDI-BLM 2000). Low visitation is a function of the small number of local residents, long drives from major population centers, lack of publicized natural attractions, road conditions that limit vehicle access into many back country areas, and lack of developed facilities.

MVMA and WSA

The Adobe Town WSA, Monument Valley and the Haystacks adjacent to the DFPA are destinations for a small number of wilderness-oriented recreationists including some recreationists that are guided by a local outfitter. Approximately 23 square miles of the MVMA (14 square miles of BLM land) are within the DFPA. Oil and gas development could occur in any of the 23 sections if access through BLM lands was granted.

Management direction for the MVMA states that designation of the MVMA as an ACEC will be deferred until determination can be made that specific resources meet the ACEC relevance and importance criteria. If specific resources are identified that meet the relevance and importance criteria, the MVMA will then be considered for designation as an ACEC. Should the area be designated as an ACEC, visitation by recreationists seeking isolation and solitude may increase substantially in the MVMA.

The Adobe Town WSA, approximately 89,000 acres in size, is remote and contains some of the region's most dynamic spaces and diverse visual resources. The WSA and DFPA share a common border for approximately 21 miles along the entire eastern boundary of the WSA and a segment on the north. Lands with wilderness qualities, whether existing wilderness areas, recommended and managed as WSA's, or lands under study for wilderness consideration, typically attract recreationists in search of solitude and isolation.

3.10 VISUAL RESOURCES

The characteristic landscape is moderately undulating along the eastern border, west of Dad with occasional areas of steep topography (badland breaks and buttes) which stand out as contrasting

forms. Mulligan Draw, Willow Creek, and Sand Creek are distinctive drainages with subtle changes in vegetation and topography. Numerous additional small drainages dissect the landscape adding diversity. The northern and western edges of the DFPA are typical of the more rugged sections of the Washakie Basin. The Haystacks north of Haystack Bend are a unique visual resource. Flat Top Mountain is a distinctive feature in the southeast quadrant. The combination of topography, buttes, badland breaks, and variations in vegetation subdivide the area into a number of small viewsheds. Larger views that encompass several viewsheds are available from high points within the project area.

The sky/land interface is a significant aspect of all distant views as is the sense of spaciousness within the project area. The predominant vegetation, typical of cold desert steppe, is alkali and low sage brush, mixed desert scrub, grasses and forbs with scattered patches of big sage/rabbit brush on flatter north and east facing slopes, along drainage ways and in large depressions. Small established stands of juniper exist within the DFPA as do occasional cottonwood trees. The combination of plant communities creates a subtle mosaic of textures and colors. Predominant vegetation colors in early spring are green and gray green changing to gray green and buff ochre as grasses and forbs cure in the summer and fall. Reddish brown and buff colors of the badland formations add contrast and dominate in areas of steep topography, especially the Haystacks, Flattop Mountain and the Adobe Town WSA. The Monument Valley Area has been designated part of a special management area (MVMA) by the BLM in recognition of its unique aesthetic and cultural values. Although mainly north and west of the project area, the Haystacks in MVMA comprise the most scenic visual backdrop to views from the project area.

Evidence of cultural modification in the DFPA includes improved and unimproved roads, power lines, livestock facilities, stock ponds, and some oil and gas production facilities. Lines of Russian thistle parallel roads on the shoulders and in ditches and on the disturbed edges of well pads, borrow sites and other areas of disturbance. Motorists traveling Wyoming Highway 789, the only major paved roadway in the area, would not have visual access to any of the project area because of viewing distance (3 to 6 miles) and intervening elevated topography. However, the DFPA would be visible from the eastern edge of the Adobe Town WSA and the Haystacks, and would also be visible from high points in the interior of both areas including East Fork Point.

The area receives moderate use by recreationists including big and small game hunters, rock collectors, wild horse and wildlife watchers, backpackers and ATV operators. The quality of the visual resource is an important part of the recreational experience for many of these users. The area is also an important entry portal from the east and west for recreationists accessing Adobe Town and Monument Valley. Access from the west is off Interstate 80 on Bitter Creek road (outside the project area). Access from the east is from Wamsutter on the Wamsutter-Dad road to the Eureka Headquarters road west to the Haystacks (Figure 1-2). Other non-recreational users of the area, including grazing permit holders and those working in the oil and gas industry, would also be affected by changes to the visual resources.

The intent of BLM's VRM program is to preserve scenic values in concert with resource development. BLM personnel responsible for visual resource management have classified the approximately 90% of the project area as Class 3 (Figure 3-17). The VRM describes the levels of change to the visual resource permitted in Class 3 landscapes as:

> Class 3 - *Contrasts to the basic elements caused by a management activity are evident but should remain subordinate to the existing landscape.*

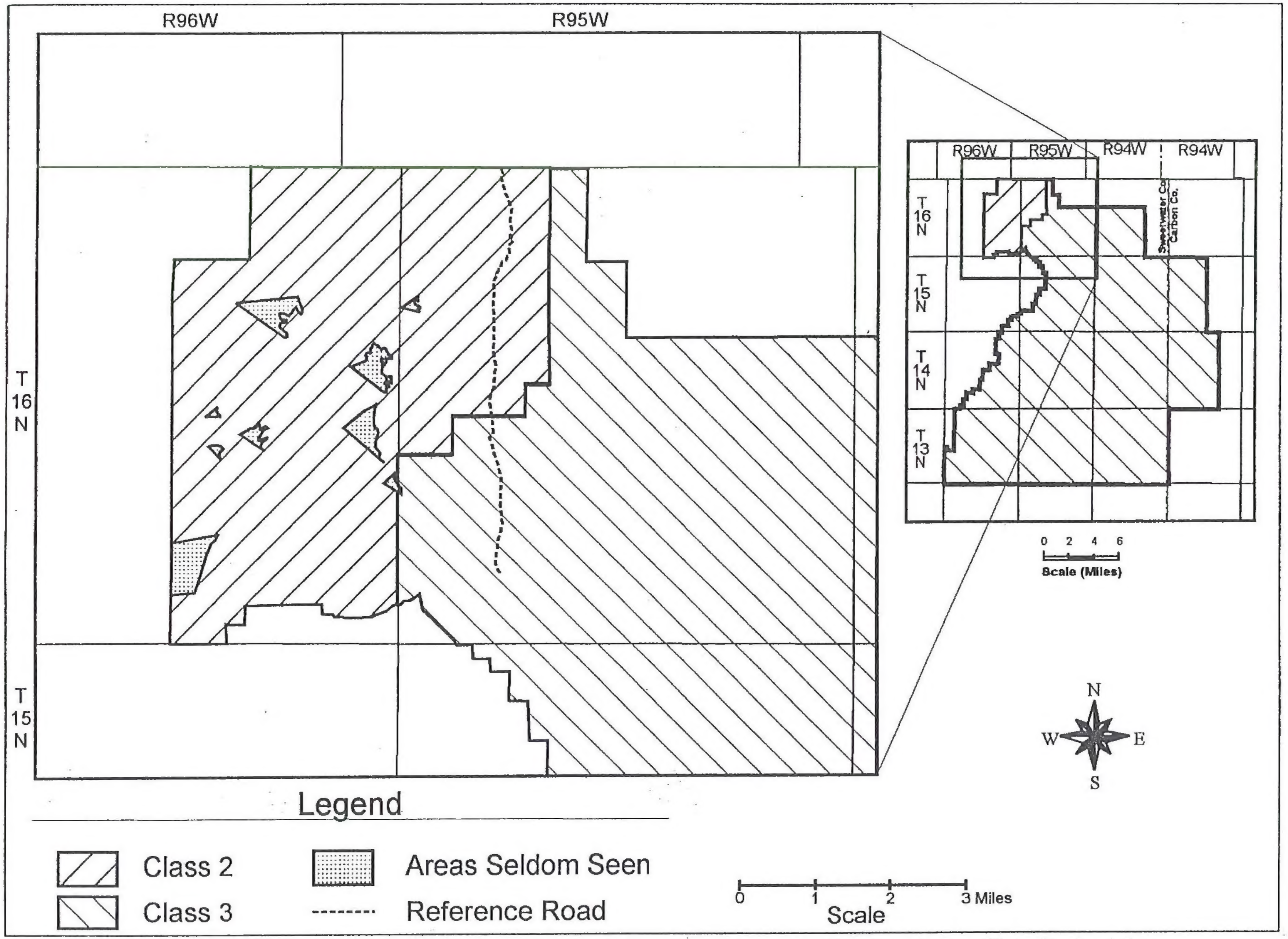


Figure 3-17. Visual Resource Management Classes and Seldom Seen Areas for the Desolation Flats Project Area

Thus for projects in Class 3 areas, project facilities, activities and site disturbance that contrast enough to attract viewer attention and are evident in the landscape are allowed, but they should be constructed in a manner that reflects the lines, forms, colors and textures of the characteristic landscape. Whenever possible, existing topography and vegetation should be utilized to screen project activities and facilities. Areas adjacent to the project areas include the Adobe Town WSA (Class 1) and the MVMA (Class 2). Portions of the DFPA abut the Adobe Town Area WSA. Approximately 23 square miles of the DFPA are in the MVMA and are thus in VRM Class 2. The VRM describes the level of change to the visual resource permitted in Class I and 2 landscape as:

> Class I - *The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be extremely low and must not attract attention.*
>
> Class 2 -*The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Surface disturbing activities will be prohibited unless or until an acceptable plan for mitigation of anticipated impacts has been agreed upon. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape. Utilize existing topography to screen roads, pipeline corridors, drill rigs, well heads and production facilities from view. Mitigation may require adjustments in surface disturbance and facility locations. Above ground facilities will be painted with a nonreflective environmental color approved by Visual Resource Management specialist. Visual resource mitigation negotiation will occur prior to any development.*

<u>MVMA and WSA</u>

The MVMA objective for visual resources specifies partial protection of scenic values. For projects in a Class 2 area, project facilities, activities, and site disturbances should not be visible as contrasting with the characteristic landscape. The Green River RMP states for the MVMA that "all management actions will be designed and located to blend into the natural landscape and to not be visually apparent to the casual observer". Since all Class 2 VRM lands are in the RSFO, visual resource management decision should reflect the RMP decision as stated above. This essentially reflects VRM Class 2 standards. The WSA shares a 21-mile long common boundary with the DFPA. If any of the WSA is designated wilderness it would become VRM Class I. Existing topography and vegetation become critical features in screening facilities and activities from view.

3.11 CULTURAL RESOURCES

3.11.1 Cultural Chronology of Area

Archaeological investigations in the Washakie Basin indicate the area has been inhabited by prehistoric people for at least 10,000 years from Paleoindian occupation to the present. The accepted cultural chronology of the Washakie Basin is based on a model for the Wyoming Basin by Metcalf (1987) and revised by Thompson and Pastor (1995). The Wyoming Basin prehistoric chronology is documented in Table 3-23. Not all sites discussed below are located in the project area.

Table 3-23. Prehistoric chronology of the Wyoming Basin.

Period	Phase	Age (B.P.)
Paleoindian		12,000-8500
Early Archaic	Great Divide	8500-6500
	Opal	6500-4300
Late Archaic	Pine Spring	4300-2800
	Deadman Wash	2800-2000/1800
Late Prehistoric	Uinta	2000/1800-650
	Firehole	650-300/250
Protohistoric		300/250-150

Source: Metcalf (1987), as modified by Thompson and Pastor (1995)
B.P. is before present

Paleoindian Period - The oldest period for which there is solid archaeological evidence is the Paleoindian, beginning ca. 12,000 years B.P. and ending around 8500 B.P. This is the transition period from the periglacial conditions of the Wisconsin ice advance during the terminal Pleistocene to the warmer and drier climatic conditions of the Holocene. A savanna-like environment with higher precipitation than occurs today was prevalent in southwest Wyoming. Understanding paleoenvironmental conditions operating at the end of the Pleistocene and into the Holocene will provide insights into the articulation between human populations and the environment (Thompson and Pastor 1995). Paleoindian sites are rare in southwest Wyoming. However, isolated surface finds of Paleoindian projectile points are not uncommon and suggest that site preservation may be a major factor affecting the number of known sites. The Paleoindian tool assemblage includes lanceolate points, gravers, and end-scrapers.

Archaic Period - Settlement and subsistence practices in southwest Wyoming remained largely unchanged from the end of the Paleoindian period through the Archaic and continued until at least the introduction of the horse, or even until Historic Contact. Reduced precipitation and warmer temperatures occurred ca. 8500 B.P. The environmental change at the end of the Paleoindian period led to a pattern of broad spectrum resource exploitation which is reflected in the subsistence and settlement practices of the Archaic period which became more diverse. The Archaic period is divided into the Early and the Late periods and subdivided in the Great Divide and Opal and the Pine Spring and Deadman Wash phases, respectively. Large side- and corner-notched dart points were used for hunting. The presence of ground stone implements suggests a greater use pf plant resources during the Archaic. Faunal assemblages from Archaic components document increased use of small animals (Thompson and Pastor 1995). At the Yarmony site in Colorado, at least one housepit has been investigated which produced dates of ca. 6300 B.P. (Metcalf and Black 1991). The housepit is a large, semi-subterranean, two-room dwelling containing four slab-lined storage bins, interior hearths and other floor features. Large side-notched points have not been recovered from components dated to the Great Divide phase in the Wyoming Basin. The earliest dated context for side-notched points are Component I at Maxon Ranch (6400-6000 B.P.), west of the project area. Large side-notched points from the Great Basin and Colorado Plateau occur as early as 7000 years B.P.

Late Prehistoric Period - The Late Prehistoric period lies between 2000/1800 B.P. and 300/250 B.P. and is subdivided into the Uinta and the Firehole phases. Large-scale seed processing and an increase in the number of features is noted in the Late Prehistoric period as is the presence of pottery and the introduction of the bow and arrow technology. A characteristic of the Uinta phase is clusters of semi-subterranean structures dating to ca. 1050 B.P. At least two different types of structures have been identified: a more substantial, cold weather habitation present at the Nova site (Thompson 1989) and a less substantial, warm weather structure serving more as a windbreak present at the Buffalo Hump site (Harrell 1989).

The Firehole phase is distinguished from the preceding Uinta phase by a dramatic decline in radiocarbon dates possibly related to a decline in population density. The South Baxter Brush Shelter site (Hoefer et al. 1992) and the Firehole Basin 11 site (Metcalf and Treat 1979) are sites located west of the project area attributed to the Firehole phase.

Protohistoric Period - The Protohistoric period begins sometime after 300 years B.P. with the first European trade goods to reach the area, and ends with the development of the Rocky Mountain fur trade 150 years ago. The Wyoming Basin was the heart of Shoshone territory during this period, with occasional forays into the area by other groups such as the Crow and Ute (Smith 1974). The most profound influence on native cultures during this time was the introduction of the horse enabling Native Americans to expand their range. All forms of rock art denoting horses, metal implements, and other Euro-American goods are associated with the Protohistoric period including the Upper Powder Spring Hunting Complex site immediately west of the project area (Murcray 1993). Metal projectile points have been recovered from both surface and subsurface contexts in southwest Wyoming.

Historic use of the area is limited by the formidable topographic relief. Steep canyons, inadequate water supply, badlands, and escarpments make the area inhospitable for settlement with only limited ranching activities present. Some grazing occurred and is recognized by a very insignificant number of buildings and corrals depicted on the 1882 GLO maps (less than 10 in the DFPA) as well as by the few local roads. Table 3-24 represents the historic chronology of the area. Fur trapping and trading was not an important occurrence in the project area due to lack of perennial streams. The Cherokee Trail is in the extreme eastern and southern portion of the DFPA. Historic documentation indicates the Outlaw Trail trends southwest from Hole in the Wall, near Kaycee, Wyoming, to Browns Park, Colorado, located immediately southwest of the current project area. No sites have been associated with outlaw activity.

Table 3-24. Historic chronology of the Washakie Basin.

Phase	Age A.D.
Pre-Territorial	1842-1868
Territorial	1868-1890
Expansion	1890-1920
Depression	1920-1939
Modern	1939-Present

Source: Massey (1989)

3.11.2 Summary of Extant Cultural Resources

The Cultural Records Office in Laramie provided information on the previous work conducted in the DFPA and previously recorded sites. Records at Western Archaeological Services (WAS) were conducted as well as records at the RFO of the BLM. There have been 328 projects conducted resulting in the recordation of 900 sites. Of these, there are 308 Class III block and linear surveys (including 45 seismograph or geophysical surveys), 15 monitors, 3 Class II sampling surveys, 1 Cherokee Trail reconnaissance, and 1 compliance project. Limited amounts of field work have resulted in the documentation of cultural resources through survey, test excavations, examination of ethnographic records, and historic record research. Three excavations have been conducted in the DFPA. Approximately 12,263 acres (block) or ca. 5% of the project area have been inventoried for cultural resources. The project specific site density per acre cannot accurately be calculated because there are no acreage calculations for the linear projects.

The overall site density within the project area varies with the highest number of sites located along drainages and near the major topographic land forms. The Haystacks are located immediately west of the project area. Site density is high on the flanks of the Haystacks, specifically along East Haystack Wash. In the Salt Wells Resource Area Class II inventory (Treat and Tanner 1981) identified cultural resources clustered adjacent to Adobe Town Rim, the Haystacks, and Man and Boy Butte badlands. Ephemeral drainages that flow into the Washakie Basin from several escarpments such as Prehistoric Rim, Willow Creek Rim, and Powder Rim, flow into the major drainages of Skull Creek, Sand Creek, Willow Creek, Windmill Draw, Shallow Creek, and Barrel Springs Draw along with their tributaries.

Radiocarbon analysis conducted on several sites in the project area returned dates ranging from the Uinta phase at 680 ± 70 B.P. through the transition period between the Pine Springs and Opal phases at 4370 ± B.P. Twelve samples have been submitted from six sites within the project area with eight of the sites dating to the Uinta phase, one site in the transition between Uinta and Deadman Wash Phase, one site dating to the Deadman Wash phase, one site dating to the transition between Deadman Wash and Pine Spring phase, and one site dating to the transition between Pine Spring and Opal phase.

3.11.3 Site Types

Nine hundred sites have been recorded in the project area including 823 prehistoric sites, 43 historic sites, and 34 prehistoric/historic sites. Of the total site types, 91.4% are prehistoric sites, 4.8% are historic sites, and 3.8% contain both prehistoric and historic components. Of the recorded cultural resources, 24% are recommended eligible for nomination to the NRHP, 20% are recommended not eligible for nomination to the NRHP, and 56% remain unevaluated. Many of the unevaluated sites have been located during seismic inventories. Table 3-25 categorizes the sites into prehistoric open camps, prehistoric lithic debris, historic sites, and prehistoric/historic sites.

3.11.4 Prehistoric Sites

Prehistoric sites consist of camps that contain evidence of a broad range of activities including subsistence-related activities. Formal features, lithic debris, chipped stone tools, evidence of milling/vegetable processing activities including ground stone and pottery. Single as well as multiple occupations are represented.

Table 3-25. Summary of Prehistoric and Historic Sites Located in the DFPA.

Site Types	Total Number of Site Types	% of Total Sites
Habitation/hearths/FCR	329	
Open camp - ceramics	4	
Open camp - stone circles	3	
Open camp - milling/processing, groundstone	22	
Open camp - butchering/processing	5	
Total Prehistoric camps	**363**	**40.3 %**
Lithic scatters	428	
Quarry	3	
Primary procurement	7	
Secondary procurement	22	
Total Lithic debris	**460**	**51.1 %**
Cherokee Trail	1	
Cabin	1	
Mine	1	
Debris	14	
Ranching/stock herding	26	
Total Historic sites	**43**	**4.8 %**
Prehistoric camp/stone rings, ranching	1	
Prehistoric camp/historic debris	20	
Lithic scatter/historic debris	10	
Lithic scatter/stock herding	3	
Total sites (prehistoric/historic)	**34**	**3.8 %**
TOTAL SITES	**900**	**100 %**

Lithic debris scatters consist of sites containing lithic debitage or stone tools. The sites are described as representing short-term activities.

Quarries are sites where lithic raw material was obtained and initially processed. Primary and secondary lithic procurement areas are geologic locations where chert and quartzite cobbles have been redeposited.

Human burials, rock alignments, and rock art have been identified as sensitive or sacred to Native Americans. One human burial has been located in the project area. What is probably a flex burial in a slab-lined feature was encountered during the excavation at Site 48SW8803. The burial was not excavated (Metcalf personal communication 2000). Rock art, recognized as pictographs or petroglyphs, is unknown in the project area. However, immediately west of the DFPA, in the Upper Powder Springs sites, several panels of charcoal pictographs typical of Ute or Shoshone are located in the Upper Powder Springs complex as well as pecked trapezoidal anthropomorphic figures (Murcray 1993). Some of the pictographs were faded with time but had been painted red. It is important to be cognizant of the possibility of similar resources in the project area.

Three prehistoric stone circles were identified in the data base for the project area. The stone circles are located south and east of the Haystacks on West Willow Creek and East Haystack Wash. Four prehistoric cairns/caches are reported in the DFPA. Two of the cairns are located on Powder Rim overlooking Grindstone Wash, one is situated on a tableland between Sand and Willow creeks, and one is located on a high point on a tableland south of Barrel Springs Draw. Stone circle sites are sometimes important to the Native Americans for religious reasons.

Pottery/ceramics are rare in the project area. Four sites containing pottery have been identified. Both gray ware and brown sherds were recognized. Pottery is associated with the Uinta phase of the Late Prehistoric period.

Consultation with appropriate Native American tribes concerning areas of concern to them for traditional, cultural, and religious purposes would occur in accordance with the American Indian Religious Freedom act and BLM Manual 8160-1 Handbook. Native American consultation would occur within the context of specific development proposals, but would also be an ongoing process between BLM and affected Indian tribes and traditional cultural leaders (USDI-BLM 1997).

3.11.5 Historic Sites

A cabin is located on Powder Rim in a stand of juniper overlooking the Cherokee Trail. Two corral/fence ranching sites have been identified in the DFPA. One is located on a finger ridge of Powder Rim, overlooking the Cherokee Creek drainage, ca. ½ mile south of the Cherokee Trail.

One corral/fence is situated between the Cherokee Trail and the Shell Creek Stock Trail on Powder Rim. The corral is a juniper branch pen structure reportedly used as a herding or hunting camp during the historic/modern period. The Shell Creek Stock Trail was used to move cattle from outlying areas north to the Union Pacific Railroad for shipping. The Shell Creek Stock Trail has yet to be investigated and recorded.

There is a building and stable/corral along the south side of Sand Creek, east of Prehistoric Rim. Inspection of the 1882 GLO maps also revealed a corral west of Prehistoric Rim and east of Skull Creek.

A "wagon" mine is located at McPearson Spring, along the Shell Creek Stock Trail. A wagon mine is a small operation consisting of one or more people or perhaps a family that mines coal for limited use such as to heat a home and to cook. "Wagon mines, literally mines serviced by wagons instead of railroads, were a common site wherever coal was available. The wagon mines developed because wood was scarce and coal was available. The coal seams were usually visible on the surface. The mines were not considered long-term ventures and the homesteaders turned part-time miners usually opened mines without obtaining legal titles to the minerals" (Gardner and Flores 1989).

The 1930 Italo Petroleum State gas well overlooks Cherokee Draw in the Cherokee Field, on Powder Rim (Wyoming Geological Association 1950). The well has not been recorded.

The Cherokee Trail has been identified in the project area. The Cherokee Trail was used in the 1850's by members of the Cherokee Tribe moving from the Oklahoma Reservation to the California gold fields. As depicted on the 1882 GLO maps, the Southern Variant of the Cherokee Trail trends south along the spine of Flat Top Mountain crossing Hangout Wash ca. two miles south of Dripping Rock Spring. It proceeds west from the Little Snake River Valley and descends into Hart Cabin Draw and follows Sand Creek south, crossing Sand Creek and descending into the Cherokee Basin. West of Cherokee Draw, the trail ascends Powder Rim trending west along the rim to Vermillion Creek. The Cherokee Trail crosses the ridge between Sage and Current creeks and continues west/northwest to the Green River.

As with any of the westward migratory trails of the mid-1800's, variants have been documented. Reasons for variations in routes include inaccessibility at certain times of year or members of the group may have traveled the route previously and found an easier or more direct avenue to water. The route of the Cherokee Trail depicted on the USGS quadrangle maps does not exactly match the route of the trail depicted on the 1882 GLO maps. As is the case with many historic linear properties, the route of the Cherokee Trail needs to be verified in the field. On the ground inspection should be supplemented by diaries of early pioneers that followed the westward migration routes. Many of the diaries include pertinent information such as distances traveled, landmarks, water sources, and feed for the stock.

Excerpts from Cherokee Trail diarist found in *Cherokee Trail Diaries* (Fletcher et al. 1999) document stops along the southern variant of the Cherokee Trail. Fletcher et al. (1999) recounts the 1850 Brown diary account at Sand Creek:

> "July 11...20 miles...Today we had very good Road for a few miles and then the rest of the way, the worst Road that we have Traveled over since we left home. No water or Grass or Timber. The Road Dry & Dusty & pached [parched]. No game, Sage Grass scarce. at Sundown we reached the dry Bed of a large Creek where we got water by digging holes. the water tasted of Salaratas, salt. Grass scarce. Made today 20 miles – Camp 60–."

On July 12, at Camp 61, Brown indicates the party was northeast of the Little Snake River, north of Cherokee Rim. The party continued over Powder Mountain to Lower Powder Spring near the Wyoming Colorado border, immediately west of the current project area. Brown:

> "July 13...25 miles...Traveled today 25 miles very Rough Road. No grass wood or water. Traveled untill sometime in the night when we came to Sulphur Springs. Not fit for man or Beast to drink. No grass -- Camp 62–."

Gardner discusses the romanticizing of the Cherokee Trail in western lore.

> "The Cherokee Trail has received a great deal of attention by writers and even the film industry. LeRoy Hafen, in his work *The Overland Mail,* contends that the pioneering efforts of the Cherokee Indians led to the eventual development of the Overland Trail. Louis L'Amour romanticized the trail in his novel *The Cherokee Trail.* And in the 1960s a television series entitled "Cherokee Trail" drew attention to this road through southern Wyoming. The net result of the combined effort of novelists, historians, and the media has been to create a highly romanticized trail that is still not well understood in terms of the people who traveled this trail and the location of the actual route of this road taken by Cherokees traveling west from Oklahoma to California in 1850" (Gardner 1999).

The Cherokee Trail (48SW3680/CR3651) is a historic linear property located in the eastern and southern portion of the DFPA. The Cherokee Trail is recommended eligible for inclusion on the NRHP. Management of historic roads and trails that are eligible for the NRHP but are not congressionally designated will generally be the same as for designated trails including a ¼ mile protective setback on either side of the trails (USDI-BLM 1997). It has been determined that a ¼ mile buffer will be established on either side of the contributing segments of the historic Cherokee Trail.

The Outlaw Trail is purported to be in or near the project area. There is no formal documentation of the trail showing its exact location. The trail was used by the outlaws to go "from Brown's Hole north to Hole-in-the-Wall in Johnson County, Wyoming" (Kelly 1959). Historic accounts of the outlaw movements place them in Rock Springs, Green River, and Powder Springs. However, the location of the trail is largely unknown and its exact locale will be very difficult to ascertain.

3.11.6 Excavation Data

Two sites have been excavated in the DFPA and several sites have been excavated in the surrounding area. Site 48SW8803 is a short-term camp with a few fire pits, small mammal procurement, and vegetable processing. The site is located in Cherokee Draw and dates to the Uinta phase of the Late Prehistoric period and the Deadman Wash phase of the Late Archaic period. A burial was encountered at the site but not excavated. It is believed to be a slab-covered flex burial (McDonald et al. 2000). Site 48SW8808 is a short-term camp with low artifact densities, several fire pits, and ground stone. The site dates to the Uinta phase of the Late Prehistoric period (O'Brien and McDonald 2000).

The Sheehan Site (48SW4114) is a multi-component site located east of the project area. Component I dates to the Archaic period and Component II dates to the Late Prehistoric period. Site data suggests both components were short-term winter camps. Game was brought to the camp for processing and local lithic sources were exploited. The chronological differences noted in the components reflect a change from atlatl to bow and arrow. Ceramics, ground stone, and bone tools were recovered from the Late Prehistoric component but not from the Archaic component. A bone juice processing area including bone tools and ground stone was identified in the Late Prehistoric component (Bower et al. 1986).

Two sites have been excavated immediately north of the project area in recent years. Site 48CR8818 is a multi-component occupation dating to the Uinta phase of the Late Prehistoric period and the Deadman Wash phase of the Late Archaic period. The site is a low intensity plant

processing and hunting camp (Metcalf personal communication 2000). Site 48SW8842 is a multi-component site dating between 9360 B.P. and 1730 B.P. The prehistoric camp consists of seven stratified occupations with numerous pit features and two small house depressions dating to 3000 B.P. The site exhibits typical Archaic technology such as plant processing and small mammal procurement (Pool 2000).

3.11.7 Summary

The subsistence and settlement patterns in the project area reflect a hunter-gatherer lifeway. Research into the subsistence and settlement patterns used during the Archaic period indicates summer occupations in the mountains, winter occupations in the foothills, and spring and fall movements utilizing all available zones (Creasman and Thompson 1997). Subsistence patterns in the Archaic period and the Late Prehistoric period are similar in that they are based on seasonal movement throughout the basins and foothills in response to the availability of floral and faunal resources (Creasman and Thompson 1988). A wide diet breadth is evident in extensive procurement and processing of small mammals. By 450 B.P. (Shimkin 1986), or possibly earlier (Bettinger and Baumhoff 1982), Numic-speaking Shoshonean groups occupied the Wyoming Basin and continued to reside there until Euro-American expansion relegated them to reservations beginning in 1868.

Most of the significant cultural resources are found along the major ephemeral drainages and along the lower benches of escarpments that dominate the terrain in the study area (Treat and Tanner 1981). Sensitive areas include drainages such as Sand Creek, Willow Creek, Cherokee Creek, and Windmill Draw as well as their ephemerals. Powder Rim and Prehistoric Rim contain a number of sites along the edges of the rim and in the draws. Certain topographic settings have higher archaeological sensitivity such as eolian deposits (sand dunes, sand shadows, and sand sheets), alluvial deposits along major drainages, and colluvial deposits along lower slopes of ridges.

Historic use of the project area was limited by terrain and lack of perennial water sources. The historic Cherokee Trail bounds the eastern edge of the area. The Outlaw Trail may transverse the project area between Hole in the Wall, near Kaycee, Wyoming, to Browns Park, Colorado, located immediately southwest of the current project area. No sites have been documented to be associated with the trail although local outlaw lore places notorious bandits such as Butch Cassidy and the Sundance Kid in the area. Some grazing and limited ranching activities are identified by the historic debris scatters and historic record.

3.12 SOCIOECONOMICS

3.12.1 Introduction

Area socioeconomic conditions potentially affected by the Proposed Action and Alternatives include employment and earnings (in the oil and gas industry and other sectors of the economy), population, housing, local government facilities and services, local, state and federal fiscal conditions and local attitudes, opinions and values.

The primary area of analysis for potential socioeconomic affects includes Sweetwater and Carbon counties in Wyoming. Temporary housing resources in the Moffat County, Colorado community of Craig may also be affected.

3.12.2 Economic Conditions

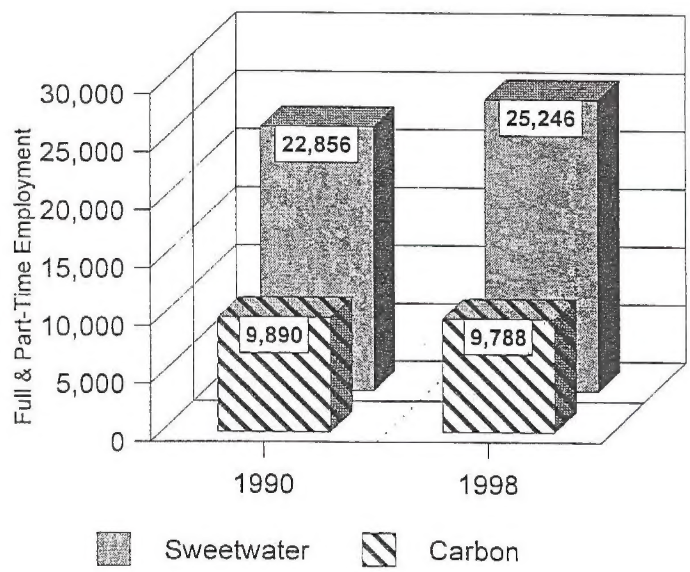
3.12.2.1 Economic Base

An area's economic base is comprised of activities which bring money into the local economy from other areas of the state, nation and world. Both Sweetwater and Carbon counties have natural resource-based economies. Basic sectors in both counties include oil and gas production and processing, coal mining, electric power generation, agriculture and transportation (primarily the Union Pacific railroad). Portions of other sectors are also basic. For example, the portions of the retail and service sectors which serve visitors (tourism, travel and recreation) can be considered basic in both counties. Sweetwater County's economic base also includes trona mining and the manufacturing of soda ash and related products, and fertilizer manufacturing (Planning Information Corporation 1996, Pedersen Planning Consultants 1998).

3.12.2.2 Employment, Unemployment and Labor Force

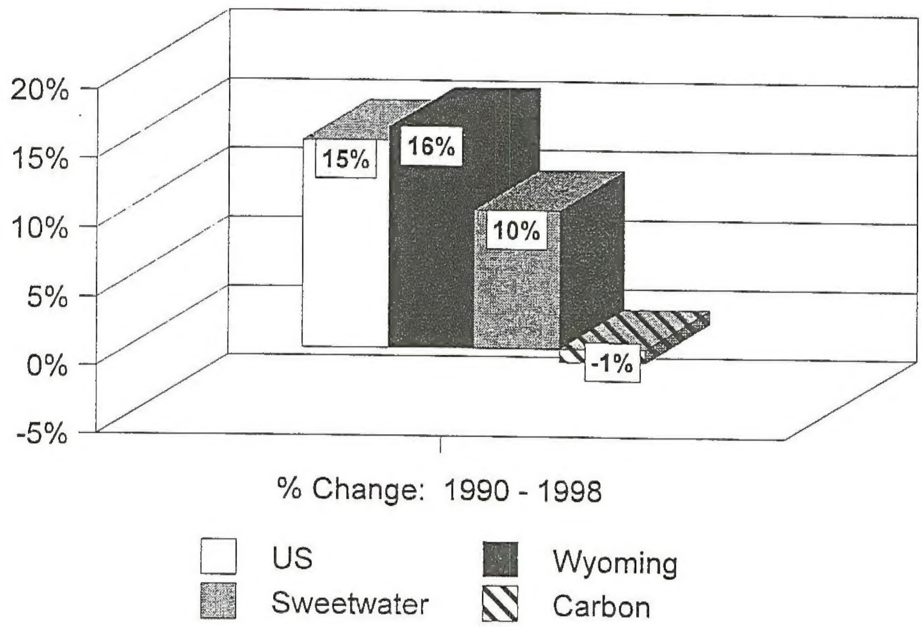
The US Bureau of Economic Analysis (BEA) collects information on the number of jobs in each county in the country. BEA employment statistics include jobs located in the county, whether they are held by a person who lives outside the county, a person who may have more than one job, a person who is a proprieter of a business, or a person who works on a farm or a ranch. Figure 3-18 displays annual average full and part-time BEA employment for Sweetwater and Carbon counties for 1990 and 1998. Figure 3-19 shows the percent change in employment for Sweetwater and Carbon counties during this period contrasted with that of the State of Wyoming and the United States as a whole. As shown in these figures, Sweetwater County employment grew by about 2,390 jobs or almost ten percent between 1990 and 1998, while Carbon County employment declined by 102 jobs or about one percent during the same period. Both counties lagged employment growth in the U.S. and Wyoming, which were about 15 and16 percent respectively during this period (WDAI 2000a).

Figure 3-18. Total Employment Sweetwater and Carbon Counties: 1990 and 1998.



Source: WDAI 2000a

Figure 3-19. Percent Change in Employment in the U.S., Wyoming, Sweetwater and Carbon Counties: 1990 and 1998



Source: WDAI 2000a

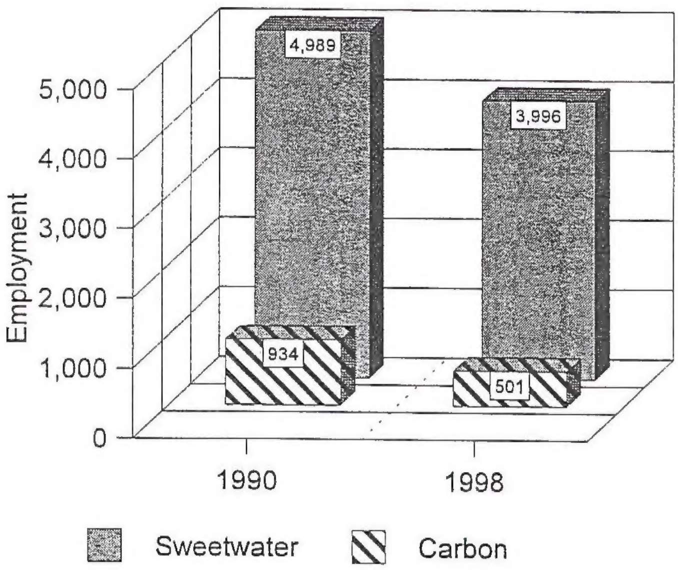
The mining sector, which includes oil and gas employment, decreased in both counties between 1990 and 1998. As shown by Figure 3-20, Sweetwater County mining employment decreased by 993 workers or about 20 percent during the period, and Carbon County mining employment decreased by 433 workers or 46 percent.

In 1993, oil and gas jobs totaled an estimated 36 percent of mining jobs and 8 percent of all jobs in Sweetwater County. In Carbon County, oil and gas jobs totaled about 12 percent of mining jobs and less than one percent of all jobs (UW 1997).

Labor force and unemployment statistics are collected by the Research and Planning Section of the Wyoming Department of Employment (WDE). These statistics reflect employees (as opposed to jobs as in the case of the BEA) and are tabulated by the employee's place of residence. The statistics include workers covered by unemployment insurance, so proprieters and agricultural workers are excluded. Also, multiple job holders are counted as one employee and workers who live outside the county under consideration are excluded. For these reasons WDE labor force totals are lower than BEA employment totals.

In both Sweetwater and Carbon counties, recent unemployment rates have remained relatively constant. Sweetwater County ten-year annual average unemployment rates have ranged from a low of 5.2 percent (1995) to a high of 6.3 percent (1992 and 1996). The 1999 unemployment rate in Sweetwater County was 6.2 percent, based on 1,293 unemployed persons out of a total labor force of 20,750. In Carbon County, ten-year unemployment rates ranged from a low of 5.2 (1997) to a high of 6.1 (1993). The 1999 Carbon County unemployment rate was 5.3, based on 446 unemployed persons out of a total labor force of 8,475 (Wyoming Department of Employment 2000).

Figure 3-20. Sweetwater and Carbon County Mining Sector Employment: 1990 and 1998



Source: WDAI 2000a

A recent Wyoming Business Council-sponsored report on the workforce of Carbon and Sweetwater counties concluded that new employers would be able to attract workers from a pool of 4,900 underemployed workers in the two counties (PFResources 2000). The report noted that an estimated 50 percent of these underemployed workers would take new jobs for salaries of $13.75 per hour or less.

Even with this relatively high number of under-employed persons, there is some indication that oil and gas companies and service firms are having difficulty attracting workers from the local workforce (Robbins 2000).

3.12.2.3 Earnings

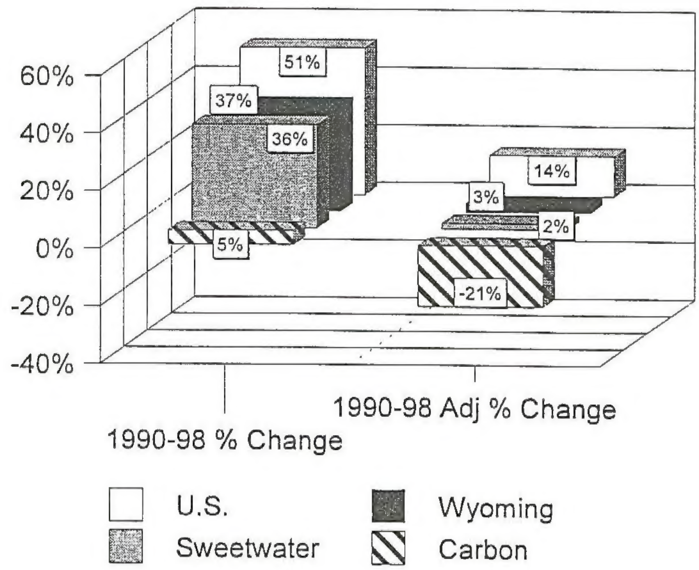
Sweetwater County earnings by place of work increased from $633 million in 1990 to $858 million in 1998, a 36 percent increase over the 8 year period (WDAI 2000b). Carbon County earnings increased from $202 million to $211 million during this period, a 5 percent increase. These increases compare to a 37 percent increase in earnings for the State of Wyoming during this period, and a 51 percent increase for the United States as a whole (Figure 3-21). However, when adjusted for inflation, Sweetwater County earnings increased by 2 percent from 1990 to 1998, and Carbon County earnings decreased by 21 percent from their 1990 level. These inflation-adjusted earnings compare to increases of 3 percent for the State of Wyoming and 14 percent for the U.S. during this period.

Oil and gas earnings increased 81 percent in Sweetwater County between 1990 and 1998, from $63.7 million to $115 million. When adjusted for inflation, Sweetwater County oil and gas earnings increased 36 percent. Recent Carbon County oil and gas earnings are not disclosed because of the small number of companies in the industry.

Oil and gas jobs are relatively high paying. In 1993, average earnings per job for the oil and gas industry in southwest Wyoming were about 60 percent higher than average earnings for all jobs,

and about twice as high as average earnings for non-mining jobs (UW 1997). However, oil and gas jobs typically pay less than other jobs in the mining sector. In 1993, oil and gas earnings were on average about 76 percent of those of the mining sector as a whole.

Figure 3-21. Change in Total Earnings 1990 - 1998: Carbon County, Sweetwater County, Wyoming and the U.S. (Current and Inflation Adjusted Dollars)



Source: WDAI 2000b; Blankenship Consulting LLC

3.12.2.4 Recent Oil and Gas Activity

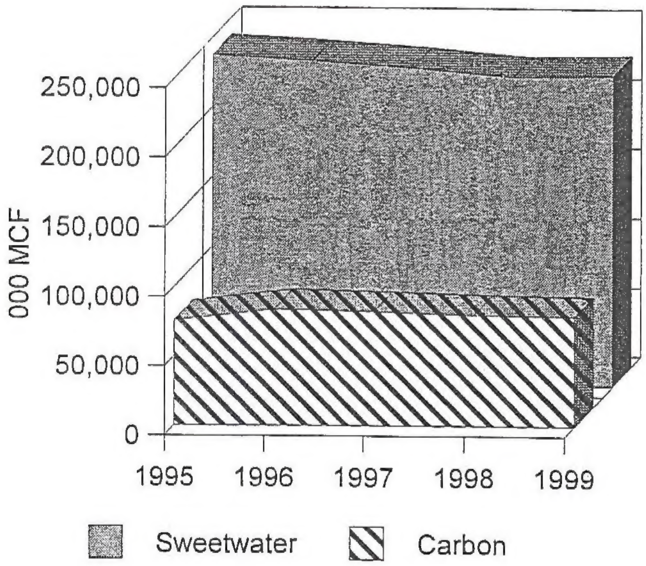
Production and approved applications for well drilling permits (APD) are two measures of oil and gas activity. As shown in Figure 3-22, annual natural gas production in Sweetwater County decreased from 238 million MCF in 1995 to 224 million MCF in 1999 (WOGCC 1995-99). In contrast, Carbon County natural gas production increased, from 76 million MCF to about 80 million MCF during the four year period.

Annual oil production in Sweetwater County decreased by about 21 percent or 1.2 million barrels during the latter part of the last decade, from 5.8 million barrels in 1995 to 4.5 million barrels in 1999. After some losses in 1996, Carbon County production ended the period within 0.2 percent of the 1995 level of 1.3 million barrels (Figure 3-23).

Approved APD's reflect current and potential future oil and gas activity. Increased drilling may result in increased production if drilling efforts are successful and commodity prices increase or stabilize at economic levels. The annual number of APD's approved for Sweetwater County varied over the last several years, ranging from the 1997 high of 210 to the 1999 low of 123. In Carbon County, APD approvals have steadily increased during the period, from 50 in 1995 to 127 in 1999 (Figure 3-24).

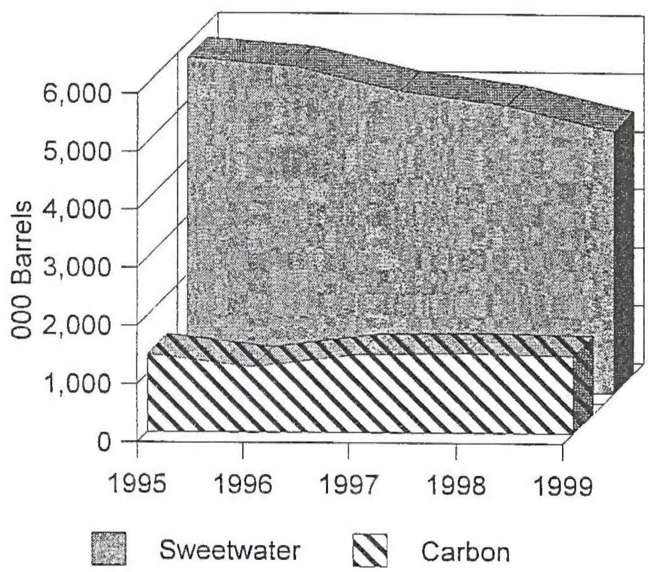
During 1999, there were a total of 1,864 producing oil and gas wells in Sweetwater County and 742 in Carbon County.

Figure 3-22. Natural Gas Production for Sweetwater and Carbon Counties, 1995 - 1999



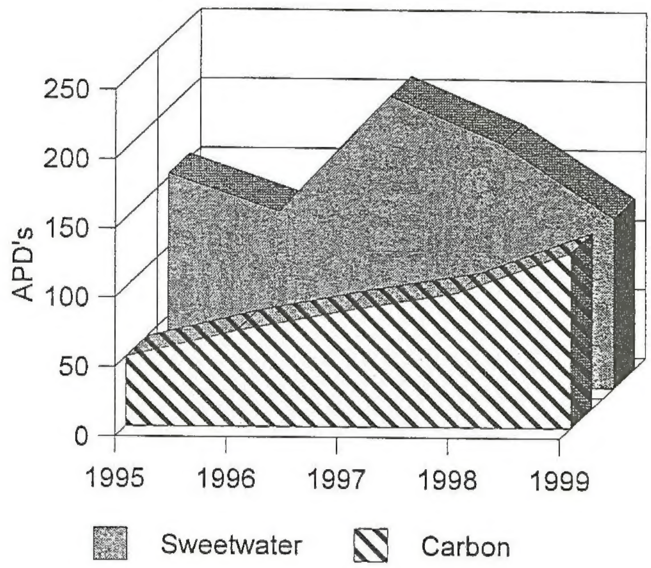
Source: WOGCC 1995-1999

Figure 3-23. Oil Production for Sweetwater and Carbon Counties: 1995 - 1999.



Source: WOGCC 1995-1999

Figure 3-24. Applications for Permit to Drill, Sweetwater and Carbon Counties: 1995- 99.



Source: WOGCC 1995-1999

3.12.2.5 Economic Activities in the Vicinity of the Proposed Action

Currently, economic activities occurring on and near the site of the DFPA include grazing (Section 3.6), low-intensity dispersed recreation (Section 3.9), and oil and gas exploration and production (Deakins 2000).

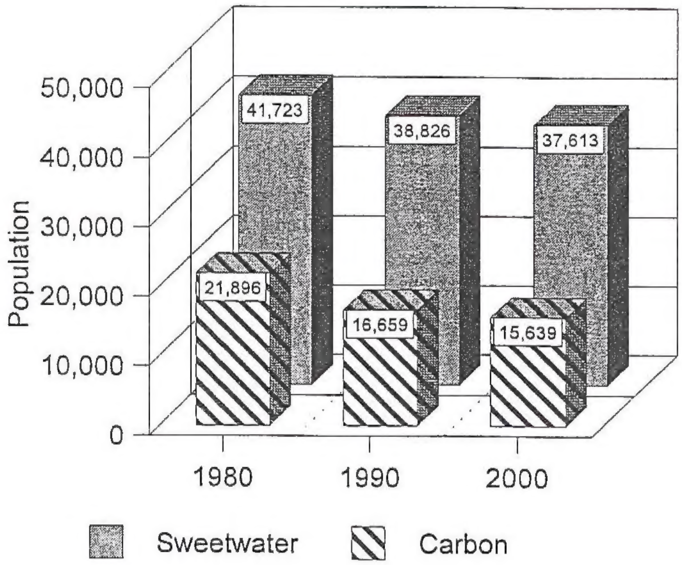
3.12.3 Population Conditions

Population levels in both Sweetwater and Carbon Counties have been volatile over the past 20 years. As shown in Figure 3-25, Sweetwater County population in 2000 was almost 10 percent lower than its 1980 level of 41,723. The 2000 Carbon County population was 29 percent lower than its 1980 level of 21,896 (WDAI 2000c, 2001).

During 1995, Sweetwater County population reached 40,635 (Table 3-26), but declined to 37,613 in 2000, about 3 percent less than its 1990 level. Population within Rock Springs, the largest community in the county, reached 19,930 in 1995, but lost almost 2 percent between 1990 and 2000. Population in the Town of Wamsutter, the closest Sweetwater County community to the DFPA, averaged about 240 to 260 persons according to state sources, but local officials believe that the current level is closer to 350 and growing, because of recent natural gas drilling activity in the area (Carnes 2000) .

According to census estimates, Carbon County population has continued to decline, losing an estimated 1,020 people or about 6.1 percent of its 1990 population over the 10 year period. Similarly, the City of Rawlins, the largest community in Carbon County, lost an estimated 374 persons, or about 4 percent of it's 1990 population. The Town of Baggs, the closest community to the DFPA, gained 76 residents or 28 percent of its 1990 population, and the Town of Dixon, several miles east of Baggs, gained 12 persons to end the period with an estimated population of 79.

Figure 3-25. Sweetwater and Carbon County Population: 1980, 1990 and 2000.



Source: WDAI 2001

The most recent population forecasts available from the Wyoming Division of Economic analysis project that population levels in both Sweetwater and Carbon counties will remain essentially flat through 2008, although those projections were developed from higher current population levels than those presented in the 2000 Census of Population and Housing and will soon be revised. Future population levels in both counties are likely to be linked in large part to national energy demand (see Section 5.3.12).

Table 3-26. Population Estimates 1990 - 1998: Sweetwater and Carbon Counties and Selected Communities.

	1990	1995	2000
Sweetwater County	38,823	40,635	37,613
Rock Springs	19,050	19,930	18,708
Wamsutter	240	246	261
Carbon County	16,659	16,034	15,639
Rawlins	9,380	9,063	9,006
Baggs	272	258	348
Dixon	70	67	79

Source: WDAI 2001

3.12.4 Housing

The nature of the drilling and field development activities (relatively short duration tasks performed primarily by contractors) results in demand for temporary housing resources such as motel rooms and mobile home and recreational vehicle (RV) spaces near the project area. The relatively few production employees are typically interested in longer-term housing resources.

There are a substantial number of both temporary housing resources (motels and RV parks) and longer-term housing resources (apartments, mobile home parks and houses for sale) available in Rock Springs and Rawlins. There are limited temporary and long-term housing resources available in Wamsutter and the Baggs area at the time of this assessment (spring 2001).

Wamsutter - Several natural gas companies have announced large, multi-year drilling programs in the Wamsutter area, which has resulted in a corresponding increase in demand for housing in the town. In February 2000, Wamsutter officials said that there was no available housing in the town to accommodate workers and their families (Rock Springs Rocket Miner 2001a). Temporary housing resources in Wamsutter include two mobile home operations; one has 26 spaces (Highland 2000, Englehart 2002), the other had 75 spaces and some pads equipped to serve RV's (Waldner 2000, 2002). There are two motels in Wamsutter. A dormant 55 space mobile home park has recently been purchased and the new owner intends to reopen it and install some rental mobile homes (Williams 2001). A local truck stop operator is considering development of an RV park (Carnes 2000).

Baggs Area - Rental housing in the Baggs area consists primarily of a mobile home park, two motels, scattered mobile home lots, one apartment building and a newly constructed rental duplex. Most temporary housing resources are fully occupied by oil and gas workers during the summer; during winter more units become vacant. The 26-space mobile home park in Baggs is equipped to accommodate RV's as well as mobile homes. Within the park there are several rental mobile homes. There is a small four-space mobile home park in Savery and a number of mobile home lots scattered throughout the Little Snake River Valley (Grieve 2000).

The two motels in Baggs have a total of 64 rooms, most of which can accommodate several guests. Both motels routinely accommodate oil and gas industry workers as well as tourists, travelers and hunters. As with mobile home parks, the motels are filled to capacity during the summer and fall and partially vacant during the winter. Most oil and gas occupants are relatively short term in nature, moving in and out of the community as work assignments are completed (Willis 2000, Hawkins 2000).

Rawlins - Rawlins has 19 motels and 4 RV parks (Hiatt 2000), and 18 mobile home parks with over 525 pads (City of Rawlins 1998). A substantial number of houses are available for purchase and there are apartments and mobile home spaces for rent (Taylor 2001).

Rock Springs - Rock Springs has ample homes for sale (Smith 2001). There are also a number of vacant rental apartments and mobile home pads. Rock Springs has 15 motels with over 1,100 rooms and 30 mobile home parks with over 1,900 pads (PIC 1997).

Craig, Colorado - The Craig area has 12 motels with a total of 472 rooms and 2 campground/RV parks with a total of 128 spaces (Moffat County Lodging Tax Panel 2000).

3.12.5 Community Facilities, Law Enforcement and Emergency Management Services

Wamsutter - Law enforcement in the Wamsutter area is provided by a town police officer, a Sweetwater County Sheriff's deputy and a Wyoming Highway Patrol officer. Emergency response services are provided by 15 volunteer emergency medical technicians operating one ambulance and 10 volunteer firefighters operating two fire trucks. The volunteer fire and ambulance services provide coverage to surrounding oil and gas operations; both services may have difficulty responding to more than one emergency at the same time. The town has submitted grant applications for new fire and ambulance vehicles and BP America, Inc. recently provided a $68,000 grant toward purchase of a new ambulance. The town has an ongoing effort to recruit new volunteers for both the fire and ambulance service.

In general, sewer, water and school facilities have capacity to serve a larger population than currently exists in Wamsutter. However, a well recently added to the system requires a water line extension to connect to the system and other improvements to pump and improve the quality of the water. The town has submitted a grant request to the Wyoming Water Development Commission for funding of these improvements. The current water and sewer system do not serve the industrial park on the south side of town and there are plans to extend service to that area. The town is developing a new library, and has identified a variety of street and infrastructure improvements, vehicles and staff that may be required to accommodate growth from the drilling programs planned for the area (Carnes 2000, Williams 2001, Rawlins Daily Times 2001).

Carbon County and the Baggs Area - Law enforcement services in the portion of Carbon County near the project site are provided by the Carbon County Sheriff's Department. Currently, coverage is provided by one full-time and one part-time deputy. The deputies provide coverage for the Town of Dixon and the community of Savery; the Town of Baggs has one police officer (Colson 2000).

Medical services in Baggs are provided at a county-owned clinic, staffed by a physician's assistant, who is supported by other medical and administrative personnel. Emergency response is provided by six volunteer emergency medical technicians (EMT) who staff two county-owned ambulances. Seriously injured patients are transported to Craig or Rawlins, depending on the location of the accident. Casper-based Flight-for-Life is also available if needed (Herold 2000).

Sewer and water services in the Town of Baggs would need expansion to accommodate population growth. Other community facilities are adequate for existing demand and have capacity to accommodate some population growth. The community is in the process of developing a community center (Terkla 2000).

Rock Springs and Rawlins - Population in both Rock Springs and Rawlins are substantially below historic high levels of the 1980's. Infrastructure in these communities has, in general, been sized to serve larger populations than currently exist.

3.12.6 Local, State and Federal Government Fiscal Conditions

Local fiscal conditions most likely to be affected by the Proposed Action and alternatives include the following:

- county, school and special district ad valorem property tax revenues,
- state, county and municipal sales and use tax revenues,

- state severance tax revenues,
- federal mineral royalties.

3.12.6.1 Ad Valorem Property Tax Revenues

Oil and gas companies pay ad valorem property taxes on production and facilities, with certain exemptions.

In Sweetwater County, fiscal year (FY) 2000 assessed valuation was over $1.1 billion, which yielded total property tax revenues of $76.6 million (WTPA 2000a). Total mill levies within Sweetwater County communities ranged from 69.6 to 75.6, including county, municipal, school and special district levies. FY 2000 assessed valuation from 1999 natural gas production totaled $337 million or about 30 percent of total assessed valuation. Assessed valuation from oil production totaled $72 million, or about 6 percent of total assessed valuation (WTPA 2000b).

Carbon County assessed valuation in FY 2000 totaled about $337 million, which yielded total property tax revenues of $21.3 million. Total mill levies within Carbon County communities ranged from 65 to 75.3. FY 2000 assessed valuation from 1999 natural gas production totaled $159 million or about 47 percent of total assessed valuation. Assessed valuation from oil production totaled 16.9 million or about 5 percent of total valuation.

3.12.6.2 Sales and Use Tax

Wyoming has a statewide four percent sales and use tax. Both Sweetwater and Carbon counties collect an additional one percent general-purpose local-option sales and use tax. Carbon County also collected an additional one percent specific-purpose local option sales and use tax, which was retired in the spring of 2001. FY 2000 sales and use tax collections in Sweetwater County totaled about $47 million and about $21 million in Carbon County (Figure 3-26).

About 28 percent (less administrative costs) of statewide sales and use tax collections and all of the general purpose local option collections (also less administrative costs) are distributed to the county and its incorporated municipalities according to a population-based formula. Collections from the specific purpose local option tax were dedicated for specific capital facilities.

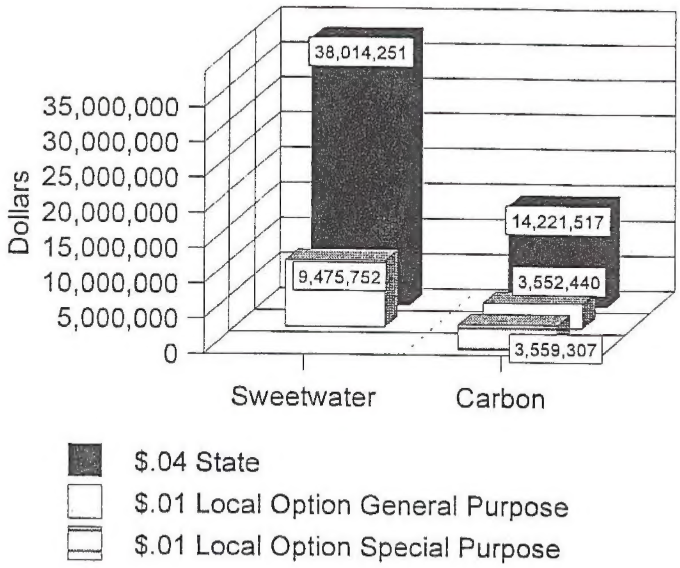
3.12.6.3 Wyoming Severance Taxes

The State of Wyoming collects a six percent severance tax on oil and natural gas. Severance tax revenues are distributed to the Wyoming Mineral Trust Fund, General Fund, Water Development Fund, Highway Fund, Budget Reserve Account, and to counties and incorporated cities and towns. In FY 2000, severance tax distributions totaled $275 million (WDAI 2000c). Of the total, 44 percent was attributable to severance taxes on natural gas and 21 percent was attributable to oil.

3.12.6.4 Federal Mineral Royalties

The federal government collects a 12.5 percent royalty on oil and natural gas extracted from federal lands. Fifty percent of those royalties are returned to the state where the production occurred. In Wyoming, the state's share is distributed to a variety of accounts, including the University, School Foundation fund, Highway fund, Legislative Royalty Impact Account, and cities, towns and counties. In FY 2000, a total of $309 million in federal mineral royalty funds were distributed to Wyoming entities (WDAI 2000d).

Figure 3-26. Sweetwater and Carbon County Sales and Use Tax* Collections: FY 2000.



Source: WDR 2000
* Includes state share of the four-percent sales and use tax and excludes lodging taxes and penalties and interest.

3.12.7 Local Attitudes and Opinions

Support for oil and gas development in Sweetwater and Carbon counties is mixed. Based on a previous NEPA assessment and a local survey, it appears that support is strongest in the communities near the proposed development, in part because many of the residents of those communities are economically tied to the oil and gas industry and/or generally believe that natural resources should be extracted from public lands. Opposition to oil and gas development comes from those whose economic interests and lifestyles may be affected, such as grazing allotment permittees and those who value the land for recreation and wildlife habitat purposes and/or believe that certain areas should be left in an undeveloped state.

The DEIS for the Greater Wamsutter Area II (USDI-BLM 1995), which is located adjacent to the DFPA, concluded the following regarding local attitudes and opinions:

> "...Overall, most (Wamsutter) area residents are likely to view this proposed development (GWA II) favorably, particularly since it would help to sustain employment opportunities, local business activity, and revenues to support public services in an area where substantial previous drilling and development activities have occurred... Despite this overall context of community acceptance, some population segments (hunters and ranchers) could potentially experience some negative effects as a result of project activities."

In Carbon County, a 1996 survey conducted in conjunction with the preparation of the Carbon County Land Use Plan provides some insight into resident attitudes and opinions regarding land use, oil and gas development, natural resource conservation and use and other topics. Just over 300 residents completed the survey (Pederson Planning Consultants 1998).

Water resource conservation and concern for government regulation of land use were the most frequent land use issues listed by respondents, followed closely by the availability of water to support future land uses, the economic viability of the ranching, timber and oil and gas industries, and the need to conserve wildlife habitat.

County-wide, 54.9 percent of survey respondents (based on a weighted average to account for respondents who marked more than one response) indicated that conservation of land, water and wildlife resources was more important than increased oil and gas production, while 36.9 percent indicated that increased oil and gas production was more important. However, among Baggs respondents, the reverse was true. About 54 percent indicated that increased oil and gas production was more important than conservation of land, water and wild life resources, while 36 percent indicated that resource conservation was more important. The land use plan attributes this difference to Baggs' greater economic dependence on future oil and gas employment.

Concerning management of federal lands, the largest number of respondents (69.5 percent) indicated that more federal lands within the county should be designated for the purpose of conserving fish and wildlife habitat and surface and groundwater resources. In addition, 60.8 percent of respondents indicated that more land should be designated for public recreation, 48.8 percent indicated more land should be leased for oil and gas industry exploration and production, 48.7 percent indicated more land should be leased for commercial mining, and 44.5 percent indicated more land should be made available to local timber companies for commercial timber harvest.

3.12.8 Environmental Justice

Executive Order (EO) 12898, "Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations" was published in the *Federal Register* (59 FR 7629) on February 11, 1994. EO 12898 requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations (defined as those living below the poverty level).

Communities within Sweetwater and Carbon counties, entities with interests in the area, and individuals with ties to the area all may have concerns about the presence of a natural gas development within the project area. Communities potentially impacted by the presence or absence of the proposed natural gas development have been identified above in this section of the DEIS. Environmental Justice concerns are usually directly associated with impacts on the natural and physical environment but these impacts are likely to be interrelated to social and economic impacts as well.

3.13 TRANSPORTATION

The regional transportation system serving the DFPA includes an established system of interstate and state highways and county roads. Local traffic on federal land is served by improved and unimproved BLM roads.

3.13.1 Access to the Project Site

Access to the project site is provided by I-80, Wyoming State Highway 789 (WYO 789), Colorado Highway 13 (CO 13) Sweetwater County Road 23/Carbon County Road 701 (SCR 23/CCR 701), also known as the Wamsutter/Dad Road, and Carbon County Road 700 (CCR 700), which travels west from WYO 789 near Baggs. Table 3-27 displays traffic and accident data, where available, for the highway access routes to the project area.

Federal and State Highways - Current traffic volumes on Wyoming federal and state highways listed in Table 3-27 are within level of service volumes set for those highways by the Wyoming Department of Transportation (Rounds 2000). Traffic volumes on these highways could increase substantially before level of service standards would be exceeded. The ten-year average accident rates for these highways are substantially below the Wyoming average for all highways of 1.6 accidents per million vehicle miles traveled (Rounds 2000).

Table 3-27. Highway Access to the Project Site.

Route	2000 ADT*	Level of Service	Accidents*
I-80 west of Wamsutter	10,640 (58% Trucks)	A	0.9
I-80 east of Wamsutter	10,650 (57.9% Trucks)	A	0.6
WYO 789 (first 5 mi. so. of Creston Jct)	850 (18.8% Trucks)	B	0.6
WYO 789 @ Baggs	1,650 (11.5% Trucks)	B	0.9
CO 13 south of the Wyoming state line	1,320 (21% trucks)	n/a	n/a

* 10 year average per million vehicle miles traveled.
Sources: Rounds 2000; CDOT 2000

SCR 23/CCR 701 (Wamsutter/Dad Road) - The Wamsutter/Dad Road is a two-lane gravel road which connects I-80 with WYO 789 at Dad, and provides access to the oil and gas fields in southeastern Sweetwater and southwestern Carbon counties. The northernmost eight miles of the road (SCR 23) are within Sweetwater County and are maintained by a motor grader operator located in Wamsutter. Most of the Sweetwater County portion of the road has been reconstructed with gravel during the last two years. Although there are no traffic counts on the Sweetwater County portion of the road, it accommodates a large amount of oil and gas traffic. Current problems on the road include damage to cattle guards and safety hazards resulting from excessive speed (Vanvalkenburg 2000).

Seven miles of the Carbon County portion of the Wamsutter/Dad Road (CCR 701) have also been reconstructed with gravel and magnesium chloride within the past year. The road is a maintenance priority within the county because of the large amount of oil and gas traffic it accommodates. Although there are no official travel counts, unofficial observations have recorded 50 and 60 vehicles per hour during mid-day in the spring and summer of 2000. Maintenance issues on CCR 701 include damage to the road from use during periods when the road is wet from rain or snow, and damage resulting from excessive speed (Nations 2000).

CCR 700 - CCR 700 provides access to the southern portion of the project area from WYO 789 just north of the Town of Baggs. The first mile of the road, which provides access to a solid waste landfill, has a chip-sealed gravel surface. The next two miles are an improved drainage gravel road, thereafter CCR 700 has a dirt surface with some gravel on hills and slopes. CCR 700 passes through several miles of private lands, and there is a bridge on Red Creek that is not designed for commercial travel. The road is lightly used by oil and gas operators in the area (Nations 2000).

3.13.2 Access within the Project Area

Access within the proposed DFPA is provided by an existing road network developed to service prior and ongoing drilling and production and livestock grazing activities. These roads include the Barrel Springs Road, the Eureka Headquarters Road, the South Barrel Springs Road, the Standard Road and the Shell Creek Stock Trail (Figure 1-2). Including these roads, the existing DFPA transportation network contains an estimated 126.1 miles of primary roads, 132.9 miles of secondary roads and 402 miles of two-track roads.

3.14 HEALTH AND SAFETY

Existing health and safety concerns in and adjacent to the DFPA include occupational hazards associated with oil and gas exploration, development and operations; industrial accidents associated with oil and gas operations (including fires, hazardous materials and hydrocarbon releases into waterways and pipeline ruptures); risk associated with vehicular travel on improved and unimproved county and BLM roads; firearms accidents during hunting season and by casual firearms use such as plinking and target shooting; illegal dumping of trash and toxic substances and low probability events such as flash floods, landslides, earthquakes and range fires.

3.15 NOISE

Other than jet aircraft overflights at high altitudes, occasional helicopter use for geophysical exploration, and localized vehicular traffic on county and BLM roads in the project area, only ongoing drilling and production operations and related traffic create even modest sound disturbances within and in the immediate vicinity of the DFPA. Wind noise is the most prevalent sound in the area.

CHAPTER 4

ANALYSIS OF ENVIRONMENTAL CONSEQUENCES

CHAPTER 4

ANALYSIS OF ENVIRONMENTAL CONSEQUENCES

4.0 INTRODUCTION

This chapter of the environmental impact statement (EIS) provides an analysis of the potential environmental consequences that would result from implementation of the Desolation Flats Natural Gas Development project and/or alternatives, including the project components (access roads, drill sites, well drilling, completion and production operations, and reclamation). Mitigation measures and BLM and agency required procedures on public lands that would avoid or reduce impacts have been included in the Proposed Action as described in Chapter 2. The following impact assessment takes these measures into consideration. Additional opportunities to mitigate impacts beyond the measures proposed in Chapter 2 for some resource disciplines are presented in this chapter under Additional Mitigation Measures.

The DFPA Operators anticipate that drilling would typically occur at 2 to 4 wells per section where hydrocarbons are encountered. Development would likely occur sporadically and not be uniformly spaced throughout the DFPA. The Operators anticipate that future development in the DFPA would likely be concentrated within or near existing fields rather than in outlying areas where development currently does not exist. This assessment analyzes the impacts of drilling up to 2 to 4 wells per section, with drilling not uniformly spaced throughout the DFPA.

As noted in Chapter 1 of the DEIS, the Mulligan Draw Field and the Dripping Rock Field are located within the DFPA. An EIS was completed in September 1992 and provided an analysis of a planned natural gas production project on public lands located within the Mulligan Draw Field. The ROD authorized Celsius Energy Company and other operators to drill and develop a maximum of 45 wells on 640-acre spacing to develop the natural gas reserves in the Mulligan Draw Field area. The Dripping Rock Unit/Cedar Breaks EA was completed in April 1985 and also provided an analysis of a planned natural gas production project on public lands located within the DFPA. The DR authorized operators to drill and develop a maximum of 58 wells on 640-acre spacing. The DFPA Operator's are proposing to increase the well density above the one well per section authorized in the Mulligan Draw ROD and the Dripping Rock Unit/Cedar Breaks DR. However, within the 24-section segment of the MVMA which is located within the DFPA, Operators propose to drill only 13 wells.

An environmental impact or consequence is defined as a modification or change in the existing environment brought about by the proposed action or alternatives to the proposed action. Impacts can be direct or indirect in nature, and can be permanent (long-term) or temporary (short-term). Impacts can vary in degree ranging from only a slight discernable change to a drastic change in the environment. Short-term impacts are impacts that occur during and immediately after well pad construction, drilling, testing, and production and last from two to five years. For purposes of this EIS, short-term impacts are defined as lasting five years or less. Long-term impacts are impacts imposed by construction and operations that remain longer than five years or extend for the life of the project or beyond.

The description of the environmental consequences for each resource section in this chapter includes the following subsections:

__Introduction__ - A description of the type and range of potential impacts that could occur as a result of implementation of the alternatives.

__Impact Significance Criteria__ - A narrative of management objectives for the resource area and the threshold or magnitude at which an impact would be considered significant, thus warranting special attention such as special mitigation. These criteria are based on government regulatory standards, available scientific documentation, previously prepared environmental documents, and the professional judgement of resource specialists.

__Direct and Indirect Impacts__ - An area-specific and site-specific impact assessment relative to the natural gas production alternatives. This section indicates which impacts are significant relative to the impact significance criteria.

__Impacts Summary__ - A narrative comparison of direct and indirect impacts that would occur under each alternative and between alternatives.

__Additional Mitigation Measures__ - Additional mitigation measures that could be applied to avoid or reduce impacts. Where additional mitigation measures have been proposed, the Residual Impacts section includes a description of how the added mitigation measures would further reduce the impacts of the alternative. Where no additional mitigation measures are proposed, the impacts would remain as described under the Direct and Indirect Impacts. Mitigation items specified in the Additional Mitigation Measures are *assumed to be* applicable to impacts on all lands, regardless of ownership. However, the Operators will coordinate with private land owners to determine which measures would be applied, to what degree, and where. The measures identified under this section would be considered for application to all BLM-administered lands.

__Residual Impacts__ - A description of how the Additional Mitigation Measures would reduce the impacts of the Proposed Action. This section is included to provide the reader and the authorized officer with sufficient information to determine whether any, or all, of the additional mitigation measures should be carried into the Record of Decision.

__Cumulative Impacts__ - A description of impacts likely to occur due to this project in combination with other on-going and recently approved activities, recently constructed projects and other past projects, and projects likely to be implemented in the near future (reasonably foreseeable future actions or RFFA's). Cumulative impacts associated with the proposed action and alternatives are summarized in detail in Chapter 5 of this EIS.

The following impact assessment assumes all applicable standards, procedures, and mitigation measures would be applied over all lands. Mitigation cannot be required by the BLM on private land with private minerals. The set of final measures applied to non-federal lands would be determined during the permitting process with WOGCC.

CHAPTER 4: ANALYSIS OF ENVIRONMENTAL CONSEQUENCES

4.1 GEOLOGY/MINERAL RESOURCES/PALEONTOLOGY

4.1.1 Introduction

4.1.1.1 Geology

Impacts could occur to the geologic environment due to project implementation and operation (e.g., alteration of existing local topography, initiation of mass movements including landslides, acceleration of erosion). Site specific dirt work done while constructing well pads and ancillary facilities could result in minor changes to the geologic environment including disturbance of soils and underlying parent material.

4.1.1.2 Mineral Resources

Petroleum reserves would be considerably depleted by implementation of the proposed action or alternatives to the proposed action within the DFPA. The proposed project would allow recovery of federal natural gas resources, and therefore, loss of reserves in the ground, as per 43CFR 3162(a), and generate private and public revenues if drilling leads to gas discovery and development.

If successful, exploratory drilling would define gas field development objectives. Good reservoir rock is not uniformly distributed within the DFPA. Therefore, development wells would most likely be drilled along productive trends or pockets between large intervening areas that are nonproductive and have little or no development potential.

Sand, gravel, and clinker may increase in demand for building materials for roads, well pads and other ancillary facilities, which could lead to local depletion of these construction resources. Additional construction grade material sources would likely be used in addition to those identified locally. Although there is the potential for mining uranium within the DFPA, no development is expected in the near future. The potential for other mineral development, including locatables (gold, other minerals) or coal is low.

4.1.1.3 Paleontology

Construction of well pads, access roads, production facilities and excavation of pipeline trenches could result in the exposure and possible destruction of fossil resources, resulting in an associated loss of scientific information. Construction-related disturbances could result in new fossil resources being discovered, properly recovered and catalogued into the collections of a museum repository, making them available for study and scientific evaluation. The magnitude of impacts associated with the destruction of fossil resources would be reduced by the implementation of paleontologic resource mitigation measures described in Section 4.1.5.3, which are based on findings in the paleontologic report (EVG 2001) prepared for the project and submitted to the BLM Rawlins, Rock Springs, and State offices.

4.1.2 Impact Significance Criteria

4.1.2.1 Geology

Impacts to geology could be significant if project implementation results in mass movement (including landsliding), subsidence, flooding, or increased erosion.

4.1.2.2 Minerals

Depletion of petroleum reserves from subsurface reservoirs resulting from oil and gas development may be considered a significant impact. However, drilling and producing petroleum reserves is allowed by federal and state agencies and private landowners. Drilling operations as described in Section 2.5.2.3 and as regulated by the BLM on federal lands, and the WOGCC on state and private lands would result in systematic development of petroleum reserves if exploratory drilling is successful.

If successful, exploratory drilling would lead to extensive oil and gas development and local depletion of construction materials (sand, gravel, and clinker), due to increased demands for surfacing material for roads and other facilities.

4.1.2.3 Paleontology

Impacts to paleontologic resources would be significant if scientifically important fossils are damaged or destroyed as a result of project implementation. Paleontologic analysis (EVG 2001) documented the presence of sedimentary formations of Early Tertiary age at the surface of the project area. These formations are known to produce scientifically important vertebrate fossils or have high potential to contain such fossils. These formations include the Washakie, Green River, and Wasatch. Vertebrate fossil localities in the Washakie Formation within or adjacent to the project area have been documented by the Field Museum (Chicago), American Museum of Natural History (New York), Carnegie Museum (Pittsburgh), and Geology Department of the University of Wyoming (Laramie). Although no institutional localities were recorded in the Browns Park, Wasatch (Cathedral Bluffs Member) and Green River (Laney and Godiva Rim members) formations on the project area, these formations and members are known to yield scientifically important fossils elsewhere in Wyoming.

4.1.3 Direct and Indirect Impacts

4.1.3.1 Geology

Direct impacts to geology as a result of project implementation would include damage to the surface environment such as alteration of existing local topography that causes mass movements including landslides, results in flooding, or accelerated erosion. The Proposed Action, Alternative A, or Alternative B would not contribute to increased risks of earthquakes, subsidence, or flooding. Earthquake-induced ground shaking could result in damage to above ground structures although the likelihood of earthquakes is low as indicated by the absence of recorded epicenters in the area. Buried structures would only be affected if shaking induces ground failure or subsurface rupture.

4.1.3.2 Minerals

Inventory of mineral resources in the DFPA revealed no major mineral resources that would be impacted by implementation of the project other than petroleum reserves. Successful field development would result in petroleum production and depletion if permitted by federal and state agencies, which is therefore not considered an adverse impact.

Successful implementation of the Proposed Action would substantially increase natural gas production in Sweetwater and Carbon counties. Under the assumptions used for this assessment,

annual gas production would total 16 million MCF in 2003, increase to 50.5 million MCF in 2021, and then gradually decrease to about 10 million MCF in 2041. By comparison, Sweetwater and Carbon County natural gas production in 1999 totaled 224 million MCF and 80 million MCF respectively. At the volumes assumed for this assessment, over 1.1 trillion cubic feet of natural gas would be produced over the 40 year production cycle.

Additionally, each Desolation Flats well is estimated to produce an annual average of 1,000 barrels of condensate. Condensate volumes are projected to increase from a 2003 total of about 32,600 barrels to a peak of about 101,000 barrels in 2021 and decrease to about 21,000 barrels in 2041. Over the 40 years, condensate volumes would total an estimated 2.26 million barrels.

Under Alternative A the increased number of wells drilled would result in greater gas and condensate production if a greater number of wells are completed successfully. Under the No Action Alternative, the Proposed Action would not be implemented and further drilling would be allowed on federal lands to the extent that it would be within the scope of existing environmental analyses (i.e. Mulligan Draw and Dripping Rock decisions) and individual APD's that could be approved on a case-by-case basis. In terms of magnitude, such impacts would likely be substantially less than for the Proposed Action.

Construction grade materials are likely to be used from local sources for surfacing materials for oil and gas facilities. If development is extensive, known accumulations of local materials may become depleted and additional sources outside of or within the DFPA would need to be identified and used. The magnitude of impacts depends on the number of roads, well pads, and other facilities built under each alternative.

4.1.3.3 Paleontology

Direct impacts to fossils would include damage or destruction of important fossils during construction, with subsequent loss of scientific information. Adverse indirect impacts would include fossil damage or destruction by accelerated erosion due to surface disturbance. In addition, improved access and increased visibility may result in unauthorized fossil collection or vandalism.

Excavation could reveal fossils of scientific significance that would otherwise have remained buried and unavailable for scientific study. Newly discovered fossils would be available for future scientific study if they are properly collected and catalogued into the collections of a museum repository along with associated geologic data. In this way significant positive consequences, including the unanticipated discovery of previously unknown scientifically significant fossils, could result.

The Proposed Action, Alternative A, and No Action Alternative could result in direct and indirect impacts to fossil resources caused by surface disturbance, especially if disturbances affect geological formations known to have a high potential to contain fossils of scientific importance (BLM Paleontology Classes 3, 4, and 5). Increased surface disturbance under Alternative A, could result in potentially more impact (both adverse and beneficial) to fossil resources over that of the Proposed Action, dependent upon where individual wells and associated facilities are sited and where ROW actions occur. Under the No Action Alternative, the Proposed Action would not be implemented and further drilling would be allowed on federal lands to the extent that it would be within the scope of existing environmental analyses (i.e. Mulligan Draw and Dripping Rock decisions) and individual APD's that would be approved on a case-by-case basis. In terms of magnitude, such impacts would likely be substantially less than for the Proposed Action.

Table 4-1. Geologic Deposits and Level of Field Survey Recommended.

Geologic Deposit	Paleontologic Potential	Field Survey Recommended
Washakie Formation - all members	BLM Class 5	detailed
Browns Park Formation	BLM Class 2	spot check
Green River Formation-Laney and Godiva Rim Members	BLM Class 5	spot check
Wasatch Formation-Cathedral Bluffs Member	BLM Class 5	spot check

4.1.4 Impacts Summary

Implementation of the Proposed Action involves the development of surface and subsurface facilities and as a result has the potential for direct and indirect impacts to geologic, mineral, and fossil resources. The nature of ground disturbance associated with the proposed action, as well as other alternatives is described in Chapter 2. No adverse impacts to the geologic or mineral resources are anticipated under the Proposed Action, Alternative A, or the Alternative B, if mitigation discussed in Section 2.5.2.11.2 is adopted. Application of this mitigation to all lands, private or public, included in the Proposed Action, Alternative A and Alternative B will further reduce potential direct and indirect impacts to these resources.

With the appropriate pre-disturbance surveys/inventories required in high probability occurrence areas for Class 4 and Class 5 areas, as described in Section 4.1.2.3.1, and case-by-case inventories in Classes 1-3, and as required by mitigation measures identified in Section 2.5.2.11.2, the likelihood that significant fossil resources would be damaged or destroyed is low.

4.1.5 Additional Mitigation Measures

4.1.5.1 Geology

Mitigation measures presented in the Soils and Water resources sections would avoid or minimize the potential impacts to the surface geologic environment and lessen the possibility of mass movement, flooding, and therefore, no additional mitigation measures are required.

4.1.5.2 Minerals

No additional mitigation measures that would address petroleum depletion are proposed.

4.1.5.3 Paleontology

With implementation of mitigation measures proposed in Section 2.5.2.11.2 for Paleontology no additional mitigation measures are required.

4.1.6 Residual Impacts

Given the application of the mitigation measures outlined in Section 2.5.2.11.2 and considering that no additional mitigation measures are proposed, no residual impact discussion is required. Impacts would remain the same as described in Section 4.1.3.

4.2 AIR QUALITY

4.2.1 Introduction

4.2.1.1 Scoping Issues

In recent years, the development of mineral resources throughout Wyoming has heightened the public's awareness of air quality. A number of public comments concerning air quality issues were received during the scoping process and are summarized below.

1. Operators should obtain permits and apply Best Available Control Technology (BACT) to all sources of volatile organic compounds (VOC) and hazardous air pollutants (HAP), including sources with emissions below the control thresholds currently set by WDEQ policy.

2. Additional air quality monitoring stations should be installed near major sources within the project area to ensure compliance with state and National Ambient Air Quality Standards (NAAQS). This monitoring should include both criteria and hazardous air pollutants.

3. Concerns that prescribed burns may affect air quality monitoring results should be addressed.

4. The public and operator employees should be informed of the risks associated with potential exposure to HAP.

5. Concerns with potential cumulative impacts of atmospheric pollution on Class I wilderness areas should be addressed.

6. Options for off-site mitigation to improve overall air quality in southwest Wyoming should be investigated.

7. The Desolation Flats air quality impact analysis should be tiered off of the previous Continental Divide/Wamsutter II, South Baggs and Pinedale Anticline analyses.

4.2.1.2 Assessment Protocol

An Air Quality Assessment Protocol was developed which proposed the methodologies for quantifying potential air quality impacts from the proposed project and surrounding developments. The criteria for evaluating the significance of the potential air quality impacts was also addressed in the protocol. The protocol was prepared with input from the BLM, State of Wyoming, FS, United States EPA Region VIII, environmental groups including the Wyoming Outdoor Council, Powder River Basin Resource Council and Northern Plains Resource Council with the project proponents, thereby ensuring that the assessment methodology was technically sound and acceptable to all parties.

In determining the protocol for this assessment, the consensus was to perform a single impact analysis for Alternative A. As proposed, Alternative A provides for an increased well density and production capacity beyond that described in the Proposed Action. Under Alternative A, 592 gas wells would be developed at 555 locations, with a forecasted success rate of 65 percent resulting in 385 producing wells. The producing wells would be supported with six compressor stations and two gas processing plants. Compression and processing requirements for Alternative A are estimated at 32,000 horsepower. The analysis of Alternative A represents the worst-case scenario. Potential air quality impacts resulting from the Proposed Action and the No Action alternatives would be less than the impacts resulting from the implementation of Alternative A.

4.2.2 Impact Significance Criteria

In order to evaluate potential air quality impacts, a scale of measurement or significance criteria must be defined. For this analysis, potential impacts to air quality are considered to be significant if project related emissions cause or contribute to:

- A violation of Wyoming (WAAQS), Colorado (CAAQS) or national ambient air quality standards (NAAQS); or
- An Exceedance of the PSD increments for Class I or Class II areas; or
- Toxic HAP concentrations that exceed state designated thresholds; or
- A lifetime incremental increase in cancer risk of one additional person in one million assuming the most likely exposure scenario; or
- Visibility impacts to sensitive areas above the designated 0.5 or 1.0 Δ dv (change in deciview) thresholds; or
- Changes in sensitive lake ANC greater than the designated LAC. For sensitive water bodies with existing ANC levels less than 25 µeq/l, the LAC is no greater than 1 µeq/l. A 10 percent change in ANC is considered significant for lakes with existing ANC levels greater than 25 µeq/l.

4.2.3 Direct and Indirect Impacts

Three primary levels of modeling (sub-grid, near-field, and far-field) were used to characterize air quality impacts. Sub-grid modeling was conducted to predict impacts in the immediate vicinity of individual sources (i.e., individual wells and compressor stations) for comparison to state and federal ambient air quality standards and PSD Class II increments. Sub-grid modeling was also utilized to predict hazardous air pollutant concentrations and incremental cancer risks resulting from project related sources. Near-field modeling was conducted to predict impacts within the Desolation Flats project area and 30 miles (50 kilometers) beyond its boundaries. The results of the near-field modeling were compared to state and federal air quality standards and PSD Class II increments. Far-field modeling was used to predict impacts to ambient air quality, PSD Class I increments and Air Quality Related Values (visibility and acid deposition) at eight sensitive areas. Table 4-2 lists the analyzed sensitive areas, the agency responsible for their management, and the average distance from the project area. It should be noted that all comparisons with PSD increments are intended only to evaluate a level of concern and do not represent a regulatory PSD increment consumption analysis. PSD increment consumption analyses are applied to large industrial sources and are solely the responsibility of the State and the Environmental Protection Agency.

Sub-grid modeling was performed using the Industrial Source Complex (ISCST3) model to assess impacts of individual wells and multiple wells in combination with compression stations at distances

of up to 4 kilometers (km) from the source. ISC is a Gaussian model that assumes instantaneous straight line transport of pollutants from the source to the receptor. In general, a 100 meter grid spacing was used for the sub-grid modeling.

Table 4-2. Analyzed Sensitive Areas

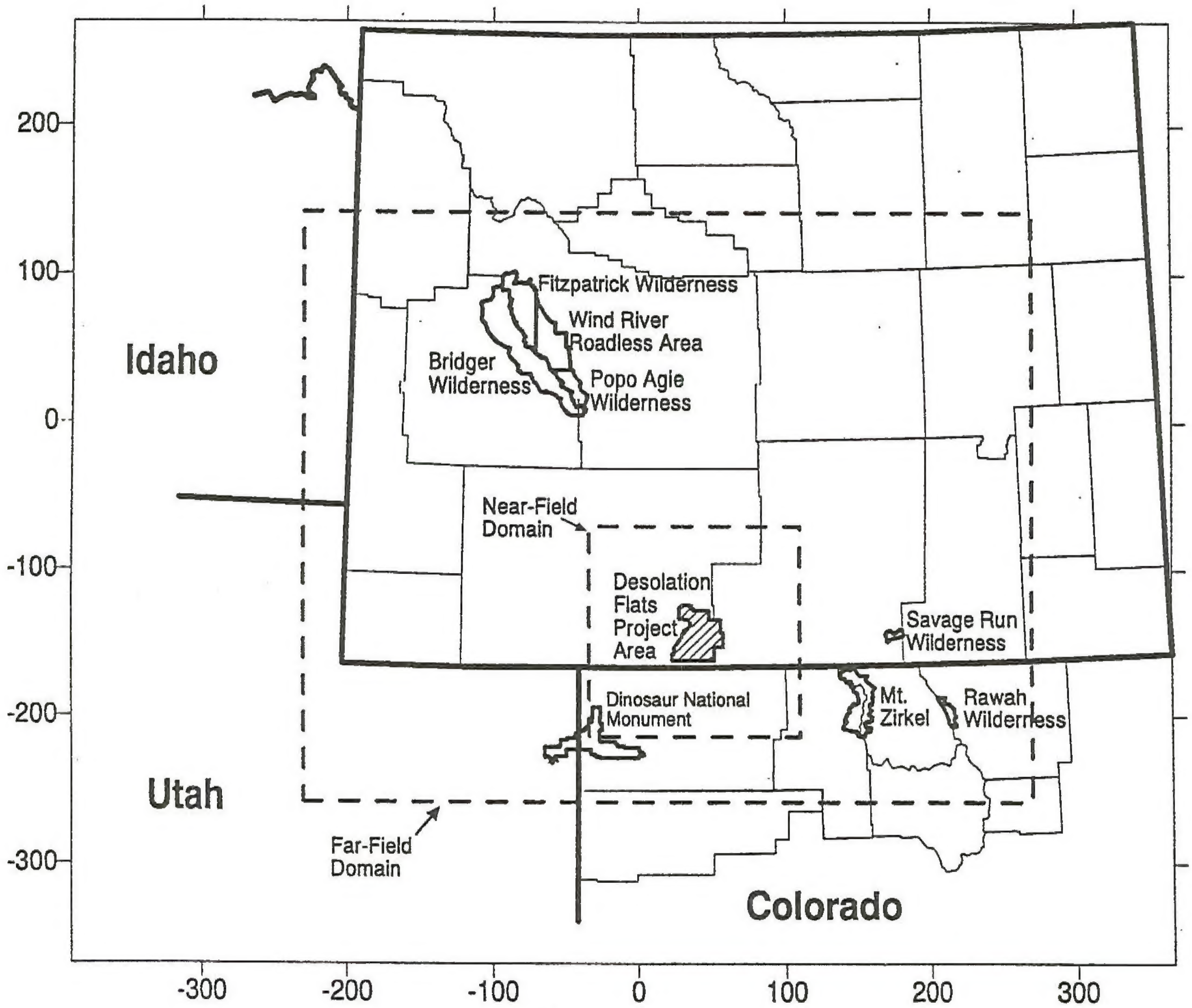
Sensitive Area	Managing Agency	Average Distance From Project Area (miles)	Direction From Project Area
Bridger Wilderness (Class I)	US Forest Service	140	NW
Fitzpatrick Wilderness (Class1)	US Forest Service	155	NW
Popo Agie Wilderness (Class II)	US Forest Service	115	NW
Wind River Roadless Area (Class II)	US Forest Service	135	NW
Dinosaur National Monument (Class II)	National Park Service	65	SW
Savage Run Wilderness (Class I)	US Forest Service	85	E
Mount Zirkel Wilderness (Class I)	US Forest Service	75	ESE
Rawah Wilderness (Class I)	US Forest Service	110	ESE

Near-field modeling was performed using the CALPUFF set of models (CALMET, CALPUFF, and CALPOST). The CALPUFF models are Lagrangian puff models that allow for wind meander and long range transport of pollutants. The Near-field modeling was performed for distances out to 50 km from the project area boundary. A 4 km grid spacing was used for the near field modeling.

Far-field modeling was also performed with the CALPUFF set of models for the entire modeling domain of 400 km (north-south) by 500 km (east-west). A four km receptor grid spacing was used throughout the modeling domain (12,500 receptors) supplemented with an additional 401 receptors located at the boundaries and within the eight sensitive areas and an additional twelve receptors located at the sensitive lakes evaluated for acid deposition. Figure 4-1 presents the near- and far-field domains along with the sensitive receptor areas.

Meteorological data used in the ISC model were collected at the South Baggs station in 1995. For CALPUFF, the meteorological input utilized a 1995 meso-scale MM5 simulation as the initial wind field. The MM5 wind field was refined utilizing terrain and land use data along with surface and upper air meteorological data collected at National Weather Service sites in 1995 throughout the region.

In addition to the sub-grid, near-field and far-field analyses, a fourth modeling methodology was used to assess the impacts of vehicles traveling on unpaved support roads. The CALINE4 model was used with hypothetical worst-case meteorology coupled with traffic volumes determined as part of the emissions estimates.



Lambert Conformal Projection
Map Origin = 42.55 N, 108.55 W
Std. Parallels: 30 N, 60 N

Figure 4-1. Modeling Domains and Sensitive Receptor Areas

A fifth modeling methodology was used to assess the potential contribution of VOC emissions to regional ozone concentrations. A simplified Reactive Plume Model (RPM II) screening methodology developed by the EPA (Scheffe 1988) was utilized for the analysis. The Scheffe methodology uses the ratio of VOC to NO_X emissions and the magnitude of the VOC emissions to evaluate potential ozone contribution of point sources. The methodology is a commonly used screening method and is considered very conservative.

4.2.3.1 Alternative A

4.2.3.1.1 Emission Inventory for Alternative A Project Related Sources

An air emission inventory was developed for all sources proposed under Alternative A. The inventory estimated emissions for five criteria pollutants; oxides of nitrogen (NO_x), SO_2, CO, particulate matter less than 10 and 2.5 microns (PM_{10} and $PM_{2.5}$), and VOC. The inventory also estimated HAP emissions for six compounds including benzene, toluene, ethylbenzene, and total xylenes (collectively called BTEX), normal-hexane(n-hexane), and formaldehyde.

Project related activities evaluated in the emission inventory included:

- construction emissions, including well pad and resource road construction;
- well drilling, completion and testing;
- wind erosion of disturbed areas;
- well production emissions, and
- gas compression and processing.

Specific details of the emission inventory are documented in the Air Quality Technical Report. A summary of the emission inventory follows.

<u>Well Development Emissions</u>

Air emissions result from three sequential well development activities: well pad and resource road construction, well drilling, and well completion. Emissions for both regulated pollutants and HAP were estimated for each activity as applicable.

Well pad and resource road construction consists of the clearing, grading, and construction of the road and well pad. The emissions sources associated with these activities include fugitive dust emissions from travel on unpaved roads, heavy construction operations, and tailpipe emissions from mobile sources used in the construction process. It was assumed that controls for these sources would include watering on the well pad and service roads during well pad and resource road construction to control emissions of particulate matter. The watering control efficiency was assumed to be 50 percent.

Well drilling consists of rigging-up, drilling, and rigging-down. The emissions sources associated with well drilling include fugitive dust emissions from travel on unpaved roads and tailpipe emissions from mobile sources such as heavy duty diesel engine powered trucks and drill rigs used in the drilling process. Particulate matter is assumed to be controlled by watering the unpaved roads, with a control efficiency of 50 percent.

Well completion includes the perforation and stimulation of the producing formations and flow testing. The emission sources associated with well completion include fugitive dust emissions from

travel on unpaved roads, tailpipe emissions from mobile sources and flaring of natural gas for well evaluation. Particulate matter is assumed to be controlled by watering the unpaved roads, with a control efficiency of 50 percent.

Both short-term maximum (hourly) and long-term (annual) emissions were estimated for construction operations. For the calculation of short-term emissions, the consecutive nature of these activities was taken into account. During a one-hour period at any given well, only one of the three development activities; road construction, drilling, or completion, would be taking place. Therefore, short-term emissions were calculated as the single maximum hourly emission rate from each of the three development activities. Long-term well development emissions were estimated on an annual basis assuming a development rate of 45 wells per year. Typically, each constructed well would undergo all three development activities; construction, drilling, and completion, over the course of a year. Therefore, long-term emissions were calculated as the sum of the emissions from the three development activities.

Well Production Emissions

Emissions to the atmosphere result primarily from three aspects of gas production: three-phase separation, triethylene glycol (TEG) dehydration, and condensate storage. The emissions of both criteria pollutants and HAP were estimated for each process as applicable.

At each well, a natural gas-fired three-phase separator heater, rated at 750,000 BTU per hour, will operate an average of 15 minutes per hour throughout the year. In addition, a glycol regeneration heater, rated at 250,000 BTU per hour, is assumed to operate 15 minutes per hour on average throughout the year. To account for seasonal variation in heater operations, the emissions were weighted for the impact analysis. During the winter months of November through April, the heater emissions were weighted at 172% of the average rate, while the remaining summer months were weighted at 28% of the average emission rate.

VOC and HAP emissions from the glycol dehydration system were estimated using Gas Research Institute's (GRI's) GlyCalc emissions estimation program. Dehydrator still vent emissions are dependent upon the produced gas composition and throughput. For this study, predicted emissions from a typical well were calculated assuming an average production rate of 1.0 MMscf/day. The inlet gas composition was estimated by averaging the gas analyses from three existing wells in the study area. HAP concentrations were conservatively estimated at the maximum concentration observed in the three existing wells. Dehydrator emissions were calculated on an individual well and a total project basis. It was assumed that no controls will be required for dehydrator still vent emissions.

Flashing emissions occur as a result of pressure differentials between the separator and the storage tank. For this study, the flashing of VOC and HAP from a condensate storage tank were estimated utilizing a HYSYM process simulation conducted for a well located near the study area. Individual well flashing emissions were based upon an average condensate production rate of two barrels per day. Since the average rate of condensate production is relatively low, it was assumed that no controls would be required for flashing emissions.

Storage tank working and breathing losses occur as a result of the filling and emptying of the storage tanks and the daily heating and cooling of the condensate which results in thermal expansion. An emission estimation program, Tanks 4.0, was utilized to calculate the storage tank

emissions. For this analysis, the condensate was assumed to have an average Reid vapor pressure of 8.0. Again, an average condensate production rate of two barrels per day was assumed.

Wind Erosion Emissions

Wind erosion emissions were calculated for disturbed areas, such as the well pad and access roads. The wind erosion estimates were calculated based upon meteorological data measured near Baggs, Wyoming in 1995.

Compression Emissions

The emissions resulting from compression operations were calculated for a total of 32,000 horsepower, based upon estimated project requirements of 30,000 horsepower for gas transportation and 2,000 horsepower for gas plant processing. Application of state-regulated BACT was considered in estimating compression emissions. Current control technology can reduce NO_X emissions to between 0.7 and 1.5 grams per horsepower-hour (g/hp-hr). NO_X emissions were quantified at the most typical rate of 1.0 g/hp-hr, while CO and VOC emissions were quantified at 3.0 g/hp-hr and 0.5 g/hp-hr respectively. Hazardous air pollutant emission rates were estimated based on AP-42 emission factors.

Total estimated emissions for Alternative A are summarized in Table 4-3. The estimate assumes 45 wells are constructed each year and 385 wells produce a combined 385 MMscf/day of natural gas and 770 bbls/day of condensate.

Table 4-3. Annual Project Emissions

Air Pollutant	Project Emissions (tons/year)			
	Well Construction and Development [1]	Well Production [2,3]	Gas Compression and Processing [4]	Total Project Emissions
NO_X	721.3	41.5	309.0	1,072
CO	198.7	10.9	927.0	1,137
VOC	26.2	14,755	154.5	14,936
SO_2	12.2	-	-	12.2
PM_{10}	236.2	51.4	6.8	294
$PM_{2.5}$	50.1	22.5	6.8	79
Benzene	-	360.3	0.6	361
Toluene	-	902.7	0.2	903
Ethylbenzene	-	474.5	-	475
Xylenes	-	624.8	0.1	625
n-Hexane	0.1	31.6	-	31.7
Formaldehyde	0.1	0.03	46.3	46.4

[1] Assumes 45 wells are constructed and developed per year

[2] Assumes 385 gas wells are producing 385 MMscf/day and 770 bbls/day of condensate

[3] Well production emissions include wind erosion

[4] Assumes total compression and processing requires 32,000 hp

4.2.3.1.2 Alternative A Sub-grid Impact Analysis

Single Well Sub-grid Analysis

Each phase in the development of a single well; construction, drilling, completion and production, was analyzed individually. Emissions from the well pad and the associated lease road were included in the analysis. The orientation of the lease road was rotated with respect to the prevailing winds in ten degree increments to determine the greatest impact for all potential site configurations. Table 4-4 presents the potential ambient air quality impacts for each development phase of an individual well. The maximum impact for each individual phase of operation was added to the monitored background concentrations and compared to the applicable ambient air quality standards. As presented in Table 4-5 and Figure 4-2, potential impacts for a single well would not cause an exceedance of the state or federal ambient air quality standards. The predicted well development impacts are also below the Class II PSD increments as shown in Table 4-6.

Table 4-4. Ambient Air Quality Impacts Adjacent to a Single Well

Pollutant	Averaging Period	Construction Impact (µg/m³)	Drilling Impact (µg/m³)	Completion Impact (µg/m³)	Production Impact (µg/m³)	Maximum Impact (µg/m³)
NO_2	Annual	0.0026	1.92	0.014	0.02	1.92
CO	1-hour	22.83	123.61	438.83	0.22	438.83
CO	8-hour	4.00	59.79	191.64	0.09	191.64
SO_2	3-hour	0.83	5.93	0.012	0	5.93
SO_2	24-hour	0.17	2.29	0.0027	0	2.29
SO_2	Annual	0.00005	0.032	0.00001	0	0.032
PM_{10}	24-hour	23.69	3.48	4.99	0.03	23.69
PM_{10}	Annual	0.0015	0.047	0.012	0.001	0.047
$PM_{2.5}$	24-hour	3.29	2.72	2.05	0.02	3.29
$PM_{2.5}$	Annual	0.00037	0.038	0.002	0.001	0.038

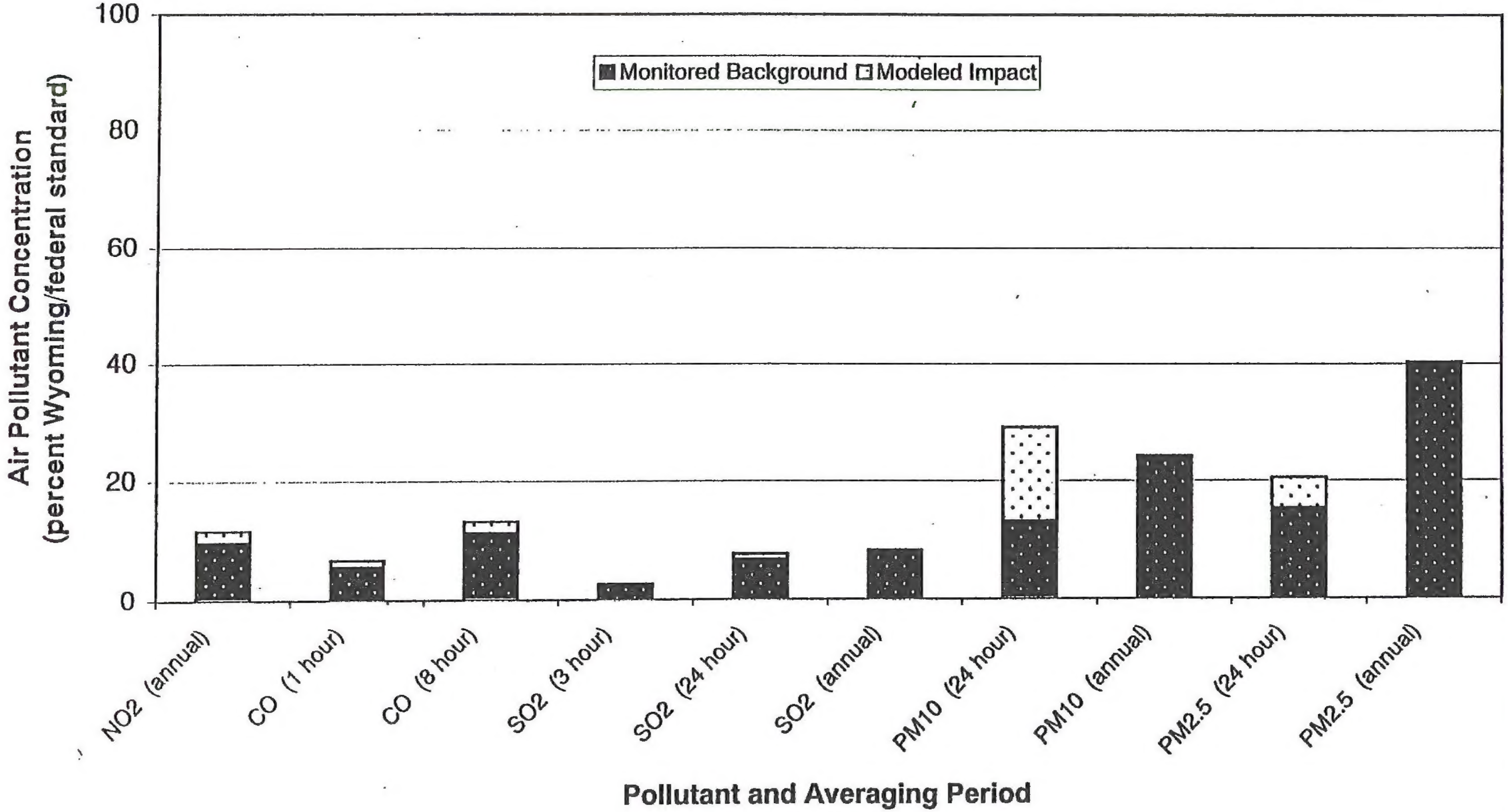


Figure 4-2 Maximum Ambient Air Quality Impacts for an Individual Well

Table 4-5. Maximum Ambient Air Quality Impacts for an Individual Well

Pollutant	Averaging Period	Maximum Single Well Impact (µg/m³)	Monitored Back-ground Level (µg/m³)	Maximum Impact Plus Back-ground (µg/m³)	National Ambient Air Quality Standard (µg/m³)	Wyoming Ambient Air Quality Standard (µg/m³)	Colorado Ambient Air Quality Standard (µg/m³)	Percentage of Most Stringent Ambient Air Quality Standard
NO_2	Annual	1.92	10	11.92	100	100	100	12%
CO	1-hour	438.83	2,299	2,738	40,000	40,000	40,000	7%
CO	8-hour	191.64	1,148	1,340	10,000	10,000	10,000	13%
SO_2	3-hour	5.93	29	34.93	1,300	1,300	700	5%
SO_2	24-hour	2.29	18	20.29	365	260	365	8%
SO_2	Annual	0.032	5	5.032	80	60	80	8%
PM_{10}	24-hour	23.69	20	43.69	150	150	150	29%
PM_{10}	Annual	0.047	12	12.047	50	50	50	24%
$PM_{2.5}$	24-hour	3.29	10	13.29	65	NA	NA	20%
$PM_{2.5}$	Annual	0.038	6	6.038	15	NA	NA	40%

Note: $PM_{2.5}$ background assumed to be one-half of PM_{10} background.

Table 4-6. Individual Well Increment Comparison

Pollutant	Averaging Time	Individual Well Impact (µg/m³)	PSD Class II Increment (µg/m³)	Percentage of Class II Increment (µg/m³)
NO_2	Annual	1.92	25	8%
SO_2	3-hr	5.93	512	1%
SO_2	24-hr	2.29	91	3%
SO_2	Annual	0.032	20	0.2%
PM_{10}	24-hr	23.69	30	79%
PM_{10}	Annual	0.047	17	3%

Gas Plant and Well Field Sub-grid Analysis

A sub-grid analysis was also performed for a typical gas plant and surrounding well field. For the analysis it was assumed that the gas plant would consist of five separate compressor units totaling 6,000 horsepower. It was also assumed that the gas plant was centered in a producing well field with a density of one well every 40 acres. This scenario yields the worst-case impacts for the combined project sources. Tables 4-7 and 4-8 present the combined gas plant and well grid impacts and compares the results to the applicable ambient standards and PSD increments. The ambient standard comparisons are also charted in Figure 4-3. As shown, the predicted impacts are below all applicable ambient standards and increment levels.

Support Road Air Pollutant Sub-grid Analysis

The analysis of emissions generated from vehicle traffic on an unpaved support road indicated that the maximum impact is from fugitive dust. The maximum 24-hour average PM_{10} impact is 23.9 µg/m^3. When added to the background concentration of 20 µg/m^3, the combined impact is 43.9 µg/m^3 which is only 29% of the most stringent ambient air quality standard (150 µg/m^3).

Table 4-7. Gas Plant and Well Field Impact

Pollutant	Averaging Period	Gas Plant and Well Field Impact (µg/m^3)	Monitored Back-ground Level (µg/m^3)	Maximum Impact Plus Back-ground (µg/m^3)	National Ambient Air Quality Standard (µg/m^3)	Wyoming Ambient Air Quality Standard (µg/m^3)	Colorado Ambient Air Quality Standard (µg/m^3)	Percentage of Most Stringent Ambient Air Quality Standard
NO_2	Annual	4.17	10	14.17	100	100	100	14%
CO	1-hour	168.39	2,299	,2,467	40,000	40,000	40,000	6%
CO	8-hour	83.69	1,148	1,232	10,000	10,000	10,000	12%
SO_2	3-hour	0	29	29	1,300	1,300	700	4%
SO_2	24-hour	0	18	18	365	260	365	7%
SO_2	Annual	0	5	5	80	60	80	8%
PM_{10}	24-hour	7.31	20	27.31	150	150	150	18%
PM_{10}	Annual	1.69	12	13.69	50	50	50	27%
$PM_{2.5}$	24-hour	2.58	10	12.58	65	NA	NA	19%
$PM_{2.5}$	Annual	0.71	6	6.71	15	NA	NA	45%

Note: $PM_{2.5}$ background assumed to be one-half of PM_{10} background.

Table 4.8. Gas Plant and Well Field Increment Comparison

Pollutant	Averaging Time	Gas Plant and Well Field Impact (µg/m³)	PSD Class II Increment (µg/m³)	Percentage of Class II Increment (µg/m³)
NO_2	Annual	4.17	25	17%
SO_2	3-hr	0	512	0%
SO_2	24-hr	0	91	0%
SO_2	Annual	0	20	0%
PM_{10}	24-hr	7.31	30	24%
PM_{10}	Annual	1.69	17	10%

Hazardous Air Pollutant Sub-grid Analysis

A HAP analysis was conducted for the worst-case well field and gas plant scenario. The potential short-term (8-hour exposure) and long-term (i.e., chronic, annual) health effects resulting from the emission of the six previously listed toxins were analyzed. Emissions of each of the hazardous air pollutants were analyzed for their direct impact on health (e.g., headaches, irritation of eyes and throat, etc.). In addition, benzene and formaldehyde emissions were analyzed for their carcinogenic effects. The results indicate that the short-term (8-hour) pollutant concentrations for each of the six toxins are below the most stringent acceptable ambient concentration level (AACL) with the exception of benzene (104%). However, potential benzene impacts were far less than the greatest AACL (only 4%). The results are summarized in Table 4-9. Emissions of these six toxins are not expected to cause short-term health impacts. The short-term impacts were assessed at receptors located 100 meters from the well pads and compressor stations. Theoretically, a person could be within 100 meters of a operating well pad for 8 hours. However, wells are not allowed to be constructed within 350 feet (107 meters) of a residence. As the distance from a well to a receptor (e.g., a residence) increases, the impacts decrease. A discussion of the basis for the AACLs is provided in the Air Quality Technical Report.

Benzene and formaldehyde exposure has been associated with potential carcinogenisis. Carcinogenic impacts are assessed by evaluating annual concentrations, and assuming maximum exposure, 24 hours per day, 365 days per year for the lifetime of the project (30 years). This is termed the maximum exposure scenario. A more realistic exposure scenario is based on 64% of an individual's time spent outdoors at full concentration, and 36% of the time spent indoors at one-quarter of the full concentration, for a period of nine years, defined in EPA literature as a realistic estimate of length of residence. This more realistic exposure scenario is termed the most likely exposure.

Annual concentrations were modeled at a distance of 1,320 feet (400 meters) from the well pad or compressor site. The 1,320 foot distance is characteristic of the minimum source-receptor distances observed on federal lands. The results, shown in Table 4-10, indicate that under the most likely exposure scenario, worst-case benzene and formaldehyde impacts are below the

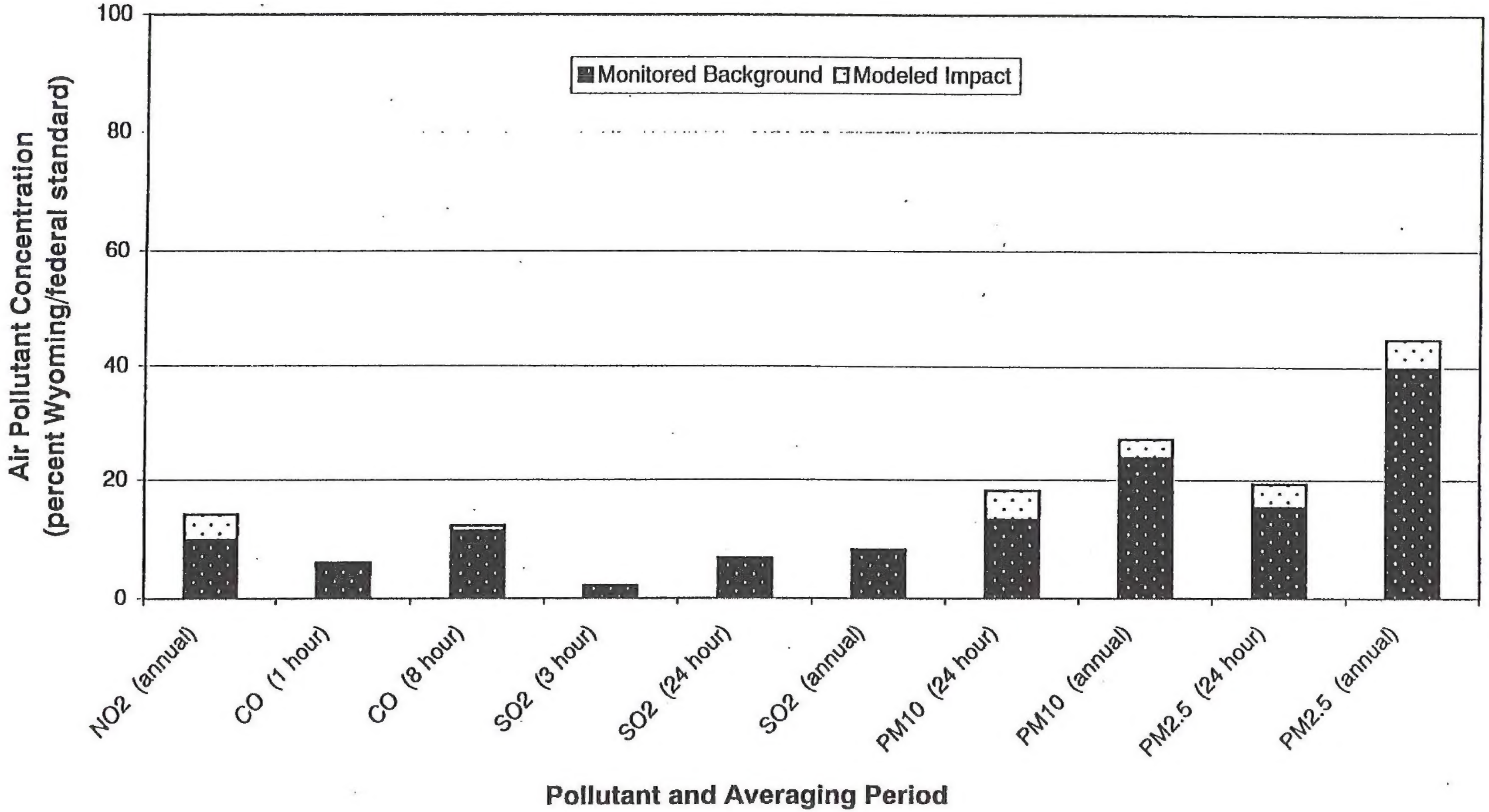


Figure 4-3 Gas Plant and Well Field Impact

designated threshold level of 1 in one million. For the maximum exposure scenario (20 years continuous outdoor exposure), the incremental cancer risk is 1.6 in one million, slightly greater than the threshold level of 1 in one million. Since the maximum exposure scenario is not reasonably likely to occur, potential incremental carcinogenic impacts are not expected to be significant.

Table 4-9. Short-Term Hazardous Air Pollutant Impacts

Hazardous Air Pollutant	Combined Potential Impact from Gas Plant and Wells (8-hour Average) (µg/m³)	Range of State Acceptable Ambient Concentration Limits (µg/m³)	Percentage of Most Stringent Acceptable Ambient Concentration Limit	Percentage of Greatest Acceptable Ambient Concentration Limit
Benzene	31.21	30 to 714	104.0%	4.4%
Toluene	79.73	1,870 to 8,930	4.3%	0.9%
Ethylbenzene	42.81	4,340 to 43,500	1.0%	0.1%
Xylenes	55.9	2,170 to 10,000	2.6%	0.6%
n-Hexane	41.47	1,800 to 36,000	2.3%	0.1%
Formaldehyde	4.13	4.5 to 71	91.8%	5.8%

Table 4-10. Potential Incremental Carcinogenic Risk

Hazardous Air Pollutant	Incremental Carcinogenic Risk Resulting From The Maximum Exposure Scenario	Incremental Carcinogenic Risk Resulting From The Most Likely Exposure Scenario
Benzene	1.6 in one million	0.6 in one million
Formaldehyde	0.9 in one million	0.3 in one million

Ozone Sub-grid Analysis

Ozone is formed in the atmosphere through a series of complex nonlinear chemical reactions involving NO_X, VOC and sunlight. The EPA ozone formation screening methodology for point sources (Scheffe 1988) provides an estimate of the maximum potential incremental ozone concentration that could possibly occur due to emissions from the new sources. The maximum potential ozone increment is then added to the current existing maximum background ozone concentration and compared with the ozone standard to determine whether there is a potential for the new sources to cause an exceedance of the ozone standard. If the results of the screening methodology indicate a high potential for an exceedance, a refined analysis is required since the screening methodology is highly conservative.

The total project NO_x and VOC emissions (wells plus compression at full development) were used in the screening analysis. Construction emissions of VOC are much less than 50 tons per year, and are therefore not expected to cause an increase in ozone concentrations (per the screening methodology). The screening tables indicate a maximum potential ozone formation of 0.009 ppm, or 18 $\mu g/m^3$. When this maximum potential is added to the background concentrations, the total ozone concentrations are 162 $\mu g/m^3$ for the 1-hour average as compared to a standard of 235 $\mu g/m^3$ and 157 $\mu g/m^3$ for the 8-hour average which is equivalent to the 8-hour standard. The results are shown in Table 4-11. In consideration of the conservatism of the estimates and screening methodology, it is not expected that exceedances of the ozone standards would occur.

There are several reasons why the ozone calculations are highly conservative: (1) the VOC/NO_x screening tables were designed to estimate the maximum ozone increment from a point source which occurs under background meteorological conditions far different than what occurs in southwestern Wyoming; (2) the project maximum hourly VOC emissions were used in the analysis while the actual daily emissions would be lower; and (3) the project sources were treated as a point source in the analysis when in reality their emissions would be more dispersed; and (4) the Scheffe method was developed for the 1-hour ozone standard while 8-hour average concentrations would be slightly lower.

Table 4-11. Potential Ozone Impact

Pollutant	Averaging Period	Gas Plant and Well Field Impact ($\mu g/m^3$)	Monitored Back-ground Level ($\mu g/m^3$)	Maximum Impact Plus Back-ground ($\mu g/m^3$)	National Ambient Air Quality Standard ($\mu g/m^3$)	Wyoming Ambient Air Quality Standard ($\mu g/m^3$)	Colorado Ambient Air Quality Standard ($\mu g/m^3$)	Percentage of Most Stringent Ambient Air Quality Standard
O_3	1-hr	18	144	162	235	None	None	69%
O_3	8-hr	18	139	157	157	157	157	100%

4.2.3.1.3 Alternative A Near-Field Impact Analysis

The CALPUFF set of models was applied in a near-field mode (4 to 50 km) to estimate short-term (less than or equal to 24-hour) and long-term (annual) regulated pollutant concentrations for comparisons with federal and state ambient air quality standards within 50 km of the DFPA (Table 4-12 and Figure 4-4). The results are also compared to the PSD Class II increments (Table 4-13).

The maximum predicted concentrations for all PSD pollutants range from much less than 1 percent (for SO_2) to 16% (for PM_{10}) of the applicable PSD Class II increments. When the maximum estimated concentrations are added to the existing maximum background concentrations, the total estimated concentrations for all regulated pollutants are also less than the applicable federal and state ambient air quality standards. Therefore, potential pollutant concentrations that may result from the project are not expected to cause significant impacts within 30 miles of the project area.

4.2.3.1.4 Alternative A Impacts Within the Monument Valley Management Area

Potential air quality impacts within MVMA were not directly assessed. However, Alternative A impacts within MVMA would not exceed the gas plant and well field impacts previously presented in Tables 4-6 and 4-7. Similarly, support road, ozone, and HAP impacts would not exceed the previously discussed levels.

Table 4-12. Alternative A Near-Field Ambient Air Quality Impacts

Pollutant	Averaging Period	Total Project Impact ($\mu g/m^3$)	Monitored Back-ground Level ($\mu g/m^3$)	Maximum Impact Plus Back-ground ($\mu g/m^3$)	National Ambient Air Quality Standard ($\mu g/m^3$)	Wyoming Ambient Air Quality Standard ($\mu g/m^3$)	Colorado Ambient Air Quality Standard ($\mu g/m^3$)	Percentage of Most Stringent Ambient Air Quality Standard
NO_2	Annual	1.51	10	11.51	100	100	100	12%
SO_2	3-hour	0.15	29	29.15	1,300	1,300	700	4%
SO_2	24-hour	0.08	18	18.08	365	260	365	7%
SO_2	Annual	0.02	5	5.02	80	60	80	8%
PM_{10}	24-hour	4.88	20	24.88	150	150	150	17%
PM_{10}	Annual	1.55	12	13.55	50	50	50	27%
$PM_{2.5}$	24-hour	1.65	10	11.65	65	NA	NA	18%
$PM_{2.5}$	Annual	0.48	6	6.48	15	NA	NA	43%

Note: $PM_{2.5}$ background assumed to be one-half of PM_{10} background.

Table 4-13. Alternative A Near-Field Increment Comparison

Pollutant	Averaging Time	Total Project Impact ($\mu g/m^3$)	PSD Class II Increment ($\mu g/m^3$)	Percentage of Class II Increment ($\mu g/m^3$)
NO_2	Annual	1.51	25	6%
SO_2	3-hr	0.15	512	0.03%
SO_2	24-hr	0.08	91	0.1%
SO_2	Annual	0.02	20	0.1%
PM_{10}	24-hr	4.88	30	16%
PM_{10}	Annual	1.55	17	9%

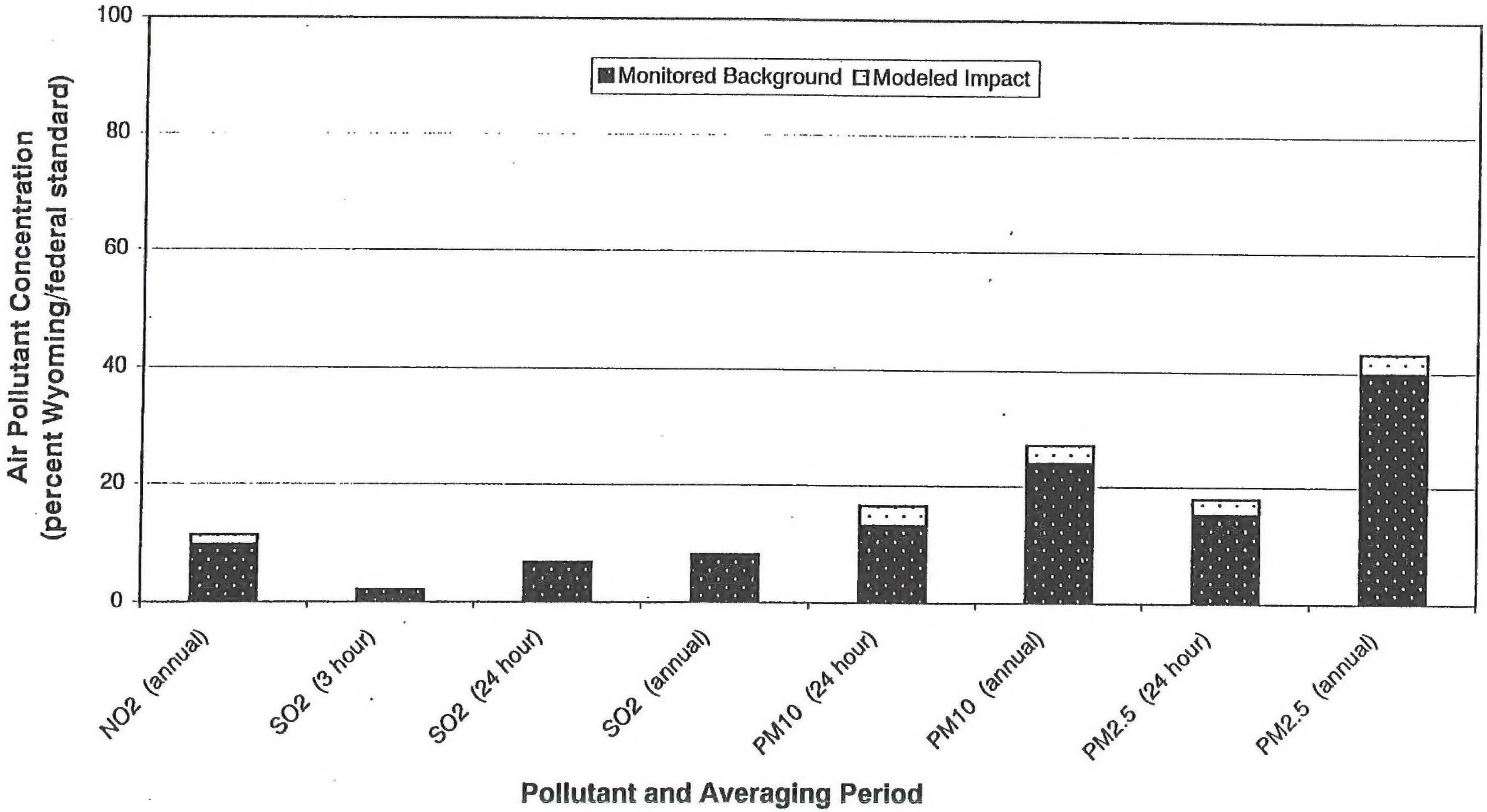


Figure 4-4 Alternative A Near-Field Ambient Air Quality Impacts

4.2.3.1.5 Alternative A Far-Field Impact Analysis

The CALPUFF model was also applied to estimate the far-field (50 km to over 200 km) ambient air quality and AQRV impacts from the Desolation Flats project. The far-field analysis estimates the total impacts due to the existing background and project sources. Impacts on air quality were estimated at nearby Class I and Class II areas. The sensitive areas include:

- Bridger Wilderness (Class I);
- Fitzpatrick Wilderness (Class I);
- Popo Agie Wilderness (Class II);
- Wind River Roadless Area (Class II);
- Dinosaur National Monument (Class II);
- Savage Run Wilderness (Class I);
- Mount Zirkel Wilderness (Class I), and
- Rawah Wilderness (Class I).

The model was used to estimate ambient NO_2, SO_2, PM_{10}, and $PM_{2.5}$ concentrations for comparison with federal and state ambient air quality standards and PSD Class I increments and to address potential AQRV impacts. The maximum impacts for all pollutants were found to occur at Dinosaur National Monument which is classified as a federal PSD Class II area. However, Colorado affords protection to that portion of Dinosaur National Monument within the state with the more stringent PSD Class I increments for SO_2. Table 4-14 and Figure 4-5 present the maximum impacts for the project sources and compare the results to the ambient standards. Regional background values were used for the comparison even though it is expected that the actual background concentrations in Dinosaur National Monument are less than the regional values assumed. The estimated concentrations for all pollutants are far below the applicable federal and state ambient air quality standards. In Table 4-15 the impacts for all pollutants at Dinosaur National Monument are compared to the more stringent PSD Class I increments although the Class I increments only apply to SO_2. The maximum concentration impacts due to project sources alone are less than one percent of the Class I increments. The far-field ambient concentration impact for all of the eight sensitive areas are provided in the Air Quality Technical Report.

Visibility Impacts

Far field impacts of project emissions on visibility degradation at the sensitive receptor areas was evaluated using the IWAQM/FLAG-recommended method (see the Air Quality Technical Report).

In this method, visibility degradation due to the project sources alone was compared against a background visibility condition based on the mean of the 20 percent cleanest days from a long-term period. Two long-term background data sets were available, one at Bridger Wilderness area and one at Mount Zirkel Wilderness area. The Bridger data period was for 1987 through June 30, 1995. The Mount Zirkel data were for the period 1994 to 1997. The Bridger data were used to represent background conditions at Bridger, Fitzpatrick, and Popo Agie Wilderness Areas and the Wind River Roadless Area. The Mount Zirkel data were used to represent conditions in Dinosaur National Monument and the Mount Zirkel, Savage Run, and Rawah Wilderness Areas.

There are two thresholds of visibility change which are used for determining the significance of potential impacts: the number of days in which the deciview change (Δ dv) is 1.0 or greater; and the number of days in which the Δ dv change is 0.5 or greater. The FS uses the 0.5 Δ dv as a LAC

threshold in order to protect visibility in sensitive areas. The 1.0 Δ dv threshold is used in the Regional Haze Regulations as a small but just noticeable change in haziness and has been used by other agencies as a management threshold. The 0.5 and 1.0 Δ dv thresholds are neither standards nor regulatory limits. Rather, they are used to alert the affected land managers that potential adverse visibility impacts may exist and the land manager may wish to look at the magnitude, duration, frequency, and source of the impacts in more detail in order to make a

Table 4-14. Alternative A Far-Field Ambient Air Quality Impacts

Pollutant	Averaging Period	Total Project Impact (μg/m³)	Monitored Back-ground Level (μg/m³)	Maximum Impact Plus Back-ground (μg/m³)	National Ambient Air Quality Standard (μg/m³)	Wyoming Ambient Air Quality Standard (μg/m³)	Colorado Ambient Air Quality Standard (μg/m³)	Percentage of Most Stringent Ambient Air Quality Standard
NO_2	Annual	0.011	10	10.011	100	100	100	10%
SO_2	3-hour	0.017	29	29.017	1,300	1,300	700	4%
SO_2	24-hour	0.003	18	18.003	365	260	365	7%
SO_2	Annual	0.0001	5	5.0001	80	60	80	8%
PM_{10}	24-hour	0.033	20	20.033	150	150	150	13%
PM_{10}	Annual	0.00007	12	12.00007	50	50	50	24%
$PM_{2.5}$	24-hour	0.044	10	10.044	65	NA	NA	15%
$PM_{2.5}$	Annual	0.0009	6	6.0009	15	NA	NA	40%

Note: $PM_{2.5}$ background assumed to be one-half of PM_{10} background.

Table 4-15. Alternative A PSD Class I Increment Comparison

Pollutant	Averaging Time	Maximum Project Impact (μg/m³)	PSD Class I Increment (μg/m³)	Percentage of Class I Increment (μg/m³)
NO_2	Annual	0.011	2.5	0.4%
SO_2	3-hr	0.017	25	0.07%
SO_2	24-hr	0.003	5	0.06%
SO_2	Annual	0.0001	2	0.005%
PM_{10}	24-hr	0.033	8	0.4%
PM_{10}	Annual	0.00007	4	0.002%

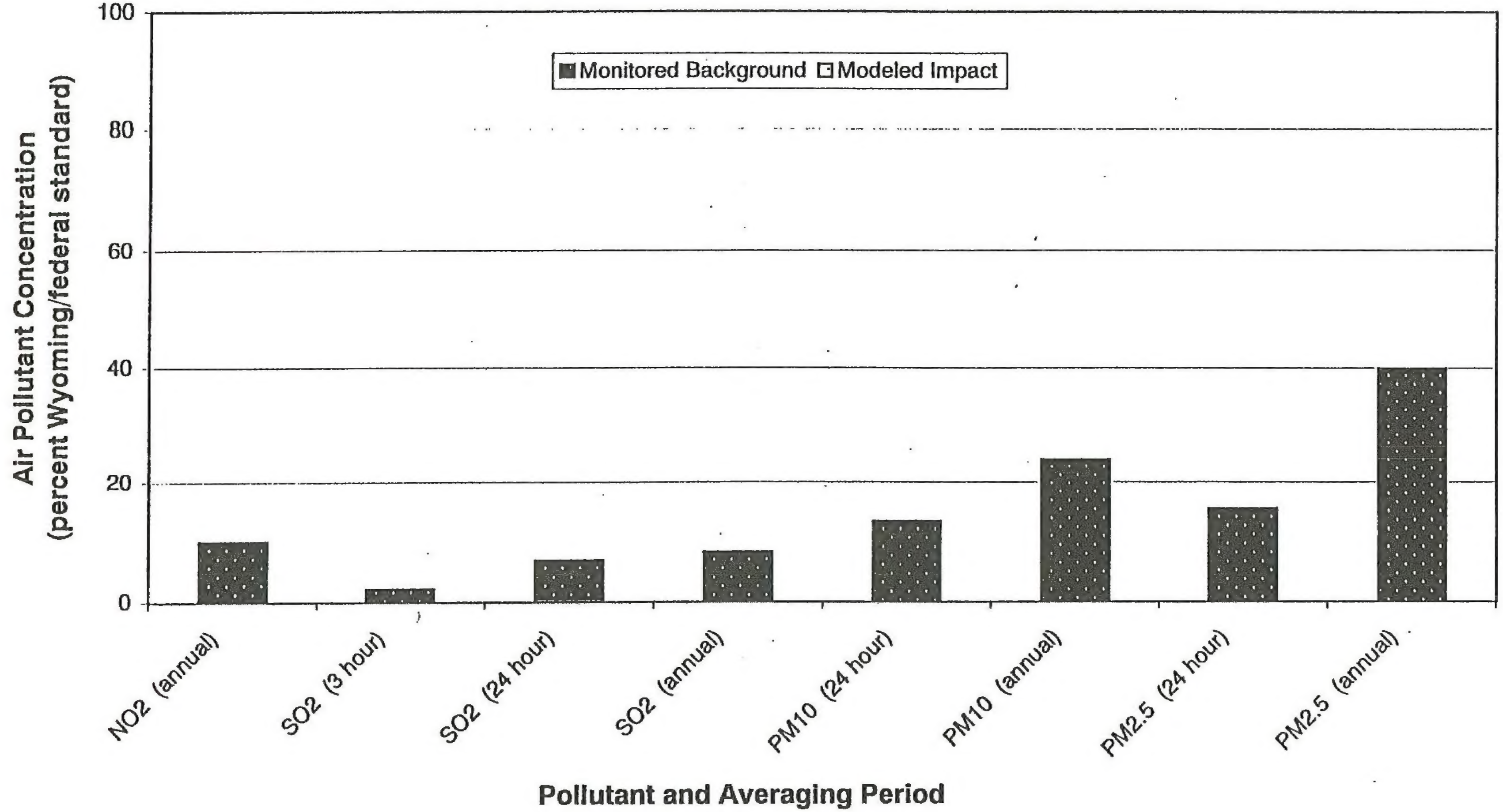


Figure 4-5 Alternative A Far-Field Ambient Air Quality Impacts

significance determination. The maximum deciview change due to the Desolation Flats project emissions alone is 0.239 Δ dv at Dinosaur National Monument (a PSD Class II area), as shown in Table 4-16. Therefore, the estimated visibility impacts due to the project alone do not exceed the LAC thresholds of 0.5 or 1.0 Δ dv.

Table 4-16. Alternative A Predicted Visibility Impacts From the Project

Sensitive Receptor Area	Maximum Visibility Impact (Δ dv)	Visibility Significance Criteria (Δ dv)	Number of Days Greater Than 0.5 Δ dv	Number of Days Greater Than 1.0 Δ dv
Bridger Wilderness	0.079	0.5 / 1.0	0	0
Fitzpatrick Wilderness	0.046	0.5 / 1.0	0	0
Wind River Roadless Area	0.048	0.5 / 1.0	0	0
Popo Agie Wilderness	0.073	0.5 / 1.0	0	0
Dinosaur National Monument	0.239	0.5 / 1.0	0	0
Savage Run Wilderness	0.115	0.5 / 1.0	0	0
Mount Zirkel Wilderness	0.093	0.5 / 1.0	0	0
Rawah Wilderness	0.079	0.5 / 1.0	0	0

Acid Deposition and Impacts

The potential impact of the project emission sources on acid deposition were analyzed using the Fox (1989) method (see Air Quality Technical Report). This method was used to estimate the potential change in ANC at each of 12 sensitive lakes (Table 4-17). This approach uses a set of equations to estimate how added deposition may change lake ANC from monitored baseline conditions. This approach assumes that ANC generation is constant, and does not factor in watershed buffering ability, lake flushing time or aquatic ecosystem bio-geochemistry. However, it does provide a conservative estimate for potential changes in lake ANC.

For lakes with background minimum measured ANC values of 25 µeq/l or greater, the FS has identified a LAC threshold of 10 percent change. For lakes with a minimum ANC background of less than 25 µeq/l, the FS has identified a LAC threshold of 1 µeq/l. Of the twelve lakes analyzed, three have ANC background less than 25 µeq/l. Table 4-17 presents the results of the analysis and indicates that the potential change in sensitive lake ANC is much less than the levels of acceptable change. Therefore, potential changes in lake ANC due to project impacts alone are not expected to be significant.

4.2.3.2 Proposed Action

Under the Proposed Action, 385 wells would be developed with an expected success rate of 65 percent or 250 producing wells. The Proposed Action represents a 35 percent reduction in well development when compared to Alternative A and it is expected that compression requirements for the Proposed Action would also be reduced by a similar percentage. Potential air quality impacts resulting from the implementation of the Proposed Action would be less than those previously described for Alternative A. No significant adverse impacts to air quality are anticipated as a result of the implementation of the Proposed Action.

Table 4-17. Alternative A Potential Acid Deposition Impacts

Sensitive Lake	Sensitive Area	Monitored Background ANC (µeq/l)	Level of Acceptable Change	Change In ANC (µeq/l)	Percentage of LAC
Black Joe Lake	Bridger Wilderness	69.0	10% (6.9 µeq/l)	0.008	0.12%
Deep Lake	Bridger Wilderness	61.0	10% (6.1 µeq/l)	0.008	0.13%
Hobbs Lake	Bridger Wilderness	68.0	10% (6.8 µeq/l)	0.005	0.07%
Upper Frozen Lake	Bridger Wilderness	5.7	1 µeq/l	0.008	0.80%
Ross Lake	Fitzpatrick Wilderness	61.4	10% (6.1 µeq/l)	0.004	0.07%
Lower Saddlebag	Popo Agie Wilderness	55.5	10% (5.6 µeq/l)	0.010	0.17%
Pothole A-8	Mount Zirkel Wilderness	16.0	1 µeq/l	0.037	3.70%
Seven Lakes	Mount Zirkel Wilderness	35.5	10% (3.6 µeq/l)	0.069	1.92%
Upper Slide Lake	Mount Zirkel Wilderness	24.7	1 µeq/l	0.039	3.90%
West Glacier Lake	Medicine Bow	26.1	10% (2.6 µeq/l)	0.044	1.69%
Island Lake	Rawah Wilderness	64.6	10% (6.5 µeq/l)	0.031	0.47%
Rawah #4 Lake	Rawah Wilderness	41.2	10% (4.1 µeq/l)	0.032	0.78%

4.2.3.3 Alternative B - No Action

Impacts to air quality under the No Action Alternative would occur at allowable levels and no significant impacts are anticipated. Actions approved under the Mulligan Draw EIS and Dripping Rock / Cedar Breaks EA may still be completed within the project area. Completion of the previously approved actions and individual APD's that would be approved on a case-by-case basis are expected to be less than Alternative A and the Proposed Action. In the absence of further development in the DFPA, no additional project related air quality impacts would occur.

4.2.4 Impacts Summary

No significant adverse impacts to air quality from the project alone are anticipated as a result of the implementation of the Proposed Action, Alternative A or the No Action Alternative. Localized increases in criteria pollutants would occur, but maximum concentrations would be below applicable federal and state standards. Similarly, hazardous air pollutant concentrations and incremental increases in cancer risk would also be below applicable significance levels. Potential impacts to visibility and acid neutralizing capacity would be below the levels of acceptable change.

4.2.5 Additional Mitigation Measures

Potential air quality impacts resulting from the project could be reduced through the implementation of engineering controls or other measures.

<u>NO_X Mitigation</u>

The primary sources of NO_X emissions associated with the project are diesel-fueled drilling rigs and natural gas-fueled compressor engines. The following mitigation measures could reduce impacts from NO_X emissions.

- The number of wells drilled each year could be restricted to a level below the 45 wells per year estimated in the analysis. By drilling fewer wells per year, the NO_X emissions would be dispersed over a greater period of time, lessening the potential impacts.

- In theory, the diesel-fueled engines currently in use on drill rigs could be replaced with cleaner burning natural gas-fueled engines. However, such equipment is not commercially available.

- For compressor engines, the WDEQ-AQD accepts a NO_X emission rate of 1.0 g/hp-hr as Best Available Control Technology. With the application of non-selective catalytic reduction, NO_X emissions for some compressor engines can be reduced to 0.7 g/hp-hr, a potential 30% reduction in compressor emissions.

- Compressors powered by electric motors could reduce NO_X emissions within the project area. However, increased NO_X emissions are likely to occur at the point of electrical generation. Solar powered generators are not technically feasible at this time.

- Project related NO_X emissions could be offset though the application of controls at non-project sources.

Particulate Matter Mitigation

The primary project related sources of particulate matter result from vehicle travel on unpaved roads and wind erosion. The following mitigation measures could reduce project related impacts from particulate emissions.

- Roads and well locations constructed on soils susceptible to wind erosion could be appropriately surfaced to reduce the amount of fugitive dust generated by vehicle traffic.

- Water or other dust suppressants could be applied as necessary on unpaved roads and construction areas to reduce problem fugitive dust emissions.

- Operators could establish and enforce speed limits on all project related unpaved roads to reduce vehicle fugitive dust.

VOC and HAP Mitigation

The primary project related sources of VOC are flash emissions from condensate storage tanks and dehydrator still vent emissions. The following mitigation measures could reduce project related impacts resulting from VOC emissions.

- Central tanks batteries could be established and vapor recovery units installed to capture storage tank flash emissions. The recovered flash emissions could then be compressed and sold as product.

- Storage tank flash emissions and dehydrator still vent emissions could be controlled with flares or incinerators. While this control technology would reduce VOC and HAP emissions, increases in NO_X and CO emissions would result.

- Operators could institute measures to ensure that dehydrator glycol pumps operate at the most efficient rate. By preventing excessive glycol circulation rates, VOC and HAP emissions are minimized.

Monitoring

Monitoring by itself cannot mitigate air quality impacts. However, additional monitoring and emissions data can better support future impact analyses.

- The BLM could continue to cooperate with existing visibility and atmospheric deposition monitoring programs. The need for, and design of, additional monitoring programs could include the involvement of interagency committees on air quality and include the Southwest Wyoming Technical Air Forum (SWYTAF), EPA Region VIII, WDEQ-Air Quality Division, and industry leaders.

- The BLM in cooperation with the WDEQ-Air Quality Division could institute an emissions tracking inventory. The tracking of emissions would require close coordination between federal land managers and state air quality regulatory personnel to develop and maintain an accurate inventory.

4.2.6 Residual Impacts

Implementation of the Proposed Action or Alternative A would cause increased levels of pollutants in the ambient air. As previously discussed, the increased pollutant concentrations are not predicted to exceed ambient air quality standards or PSD increments. The increased pollutant concentrations from the project would not directly cause visibility or acid deposition impacts exceeding the applicable LAC.

With the implementation of one or more of the previously described additional mitigation measures, the emission of air pollutants would be reduced below the levels described for Alternative A. The amount of the potential emission reductions have not been calculated.

4.3 SOILS

4.3.1 Introduction

Impacts resulting from drill pad, access road, facility site, and pipeline ROW construction could include removal of vegetation, exposure of the soil, mixing of soil horizons, soil compaction, loss of topsoil productivity, and increased susceptibility of the soil to wind and water erosion.

4.3.2 Impact Significance Criteria

The Great Divide RMP (USDI-BLM 1990a) prescribes the following objectives and standard mitigation guidelines relative to soils and watershed management that relate to this project:

- maintain soil cover and productivity where they are adequate;
- increase soil cover and productivity where these are declining;
- implement intensive practices to mitigate salt and sediment loading;
- administer watershed management practices designed to meet soils, water, and air resource management objectives;
- prohibit surface disturbing activities on unstable areas unless it can be demonstrated that the instability can be alleviated. Specific unstable areas such as landslides, slumps, and areas exhibiting soil creep will be individually identified;
- no occupancy or other surface disturbance is allowed on slopes of more than 25 percent without written permission from the Administrative Officer (AO). When development is proposed on slopes of more than 25 percent, engineered drawings for construction, drainage design, and final contours proposed after rehabilitation will be required; and
- construction will not be allowed without written permission from the AO when soils are frozen or during periods when the soil material is saturated or when watershed damage is likely to occur.

The Green River RMP (USDI-BLM 1997), including the MVMA, outlines the following objectives and actions relative to soils:

- stabilize and conserve the soils;
- increase vegetation production;
- maintain or improve surface and groundwater quality;
- protect, maintain, or improve wetlands, floodplains, and riparian areas;
- design land uses and surface disturbing activities to reduce erosion and to maintain or improve water quality;
- conduct management in the planning area to emphasize:
  - reduction of sediment, phosphate, and salinity load in drainages where possible;
  - maintenance/improvement of drainage channel stability; and
  - restoring damaged wetlands.
- avoid areas where soils are highly erodible or difficult to reclaim;
- prepare site specific activity and implementation plans, as needed;
- prepare activity implementation plans to include general watershed directives and incorporate sediment reduction and water quality improvement objectives;
- close 100-year floodplains, wetlands and riparian areas to any new permanent facilities;
- avoid surface disturbing activities that could adversely affect water quality and wetland or riparian habitat within 500 feet of, or on 100-year floodplains, wetlands, or perennial streams and within 100 feet of the edge of the inner gorge of intermittent and large ephemeral drainages; and
- implement practices, determined on a case-by-case basis, as needed to protect groundwater and prevent soil contamination.

Given the management objectives in the RMP's and as itemized above, the following criteria were used to determine the significance of impacts to soils within the DFPA:

- non-compliance with the RMP's;
- increased soil erosion that cannot be reduced by 50 percent after one year and by 75 percent after five years of soil disturbance;
- failure to have successful revegetation within three to five years of implementation;
- a reduction in soil productivity to a level that minimizes or prevents the disturbed area from recovering to pre-disturbance soil productivity levels; and
- location and construction of project facilities on sensitive soils (soils having one or more of the following characteristics: difficult reclamation potential, high erosion hazard, slope gradients greater than 25 percent, and moderate to high stability hazard) without the use of special construction methods.

4.3.3 Direct and Indirect Impacts

4.3.3.1 Proposed Action

The project activities listed above could result in adverse impacts to soils including the removal of vegetation, exposure of the soil, mixing of soil horizons, soil compaction, loss of topsoil productivity, and increased susceptibility of the soil to wind and water erosion. These impacts could increase runoff, erosion, and off-site sedimentation. As described in the Soils Section of Chapter 3, (Section 3.3.2.1) approximately 66 percent of the DFPA falls into a sensitive soils category in regard to topsoil depth and quality, with limitations to road and facilities construction, rapid to very rapid runoff potential, and severe to very severe wind and water erosion potential. Prime farmland soils, as well as farmland soils of state and local importance, do not occur in the specific project area; however, such soils occur over relatively wide areas on the Little Snake River bottomlands where extensive irrigated hay lands occur. Such soils would not be directly or indirectly impacted by the proposed project, due to the implementation of erosion and sediment control measures. Because sensitive soil mapping units are distributed throughout the DFPA, total avoidance of these sensitive areas would not be feasible. Minimizing the location of facilities in sensitive areas, to the maximum extent possible, would be required to keep adverse impacts to an acceptable level.

Existing disturbance includes: 126.1 mi of primary roads (611.1 ac); 132.9 mi of secondary roads (322.3 ac); 402 mi of 2-track roads (194.5 ac); 82.2 mi pipeline (39.9 ac) and 338.6 areas of other disturbed areas. Therefore, a total existing disturbance within the DFPA area is 1,506.4 acres or 0.5% of the total project area.

Construction of the Proposed Action would variously disturb approximately 4,923 acres of soil. This total area of temporary disturbance would comprise approximately 2.1 percent of the 233,542 acre project area. Combined with the existing disturbance of 1,506.4 acres, total disturbance would be approximately 6,429.4 acres or 2.8 percent of the 233,542 acre project area. However, as discussed subsequently, this total area of temporary disturbance would be reduced through successful reclamation.

Once a well goes into production, the size of the drill pad can be reduced to approximately 1.4 acres. The unused portion of the drill pad (cut and fill slopes, subsoil and topsoil piles, reserve pit, and portions of the drill pad) would be reclaimed as described in Chapter 2. Similarly, a portion of the combined roadway/pipeline construction ROW would be reclaimed upon production. It is assumed that all pipeline disturbances would be reclaimed while only the crown of new roads would not be reclaimed.

During the life of the project (30-50 years), total disturbances would be reduced to 2,139 acres (336 acres associated with 235 wells having 1.4 acres of remaining disturbance per well site, 1,706 acres of roads [this assumes a 65 percent drilling success rate with roads to unsuccessful wells being reclaimed] and 97 acres of surface disturbance associated with ancillary facilities) or approximately 0.92 percent of the 233,542 acre project area.

Well pads would be reclaimed to the 1.4 acre of disturbance/well and remaining disturbed road dimensions would be approximately 16.0 feet wide, or 0.6 acres per well, and 0.0 acres for pipelines. The ancillary facility would not be reclaimed since the full size of the site would be needed during production. These remaining disturbance areas would represent approximately 2,139 acres or 0.92 percent of the total project area. This disturbance would be combined with the

existing disturbance of approximately 1,506.4 acres for a total of 3,645.4 acres, or 1.6 percent of the 233, 542 acre project area. This long-term disturbance would not preclude achievement of the objectives.

Increased soil susceptibility to erosion would occur in newly disturbed areas. Soil compaction caused by equipment traffic or by increased raindrop impact after loss of surface cover may decrease infiltration and water storage capacity, increase runoff, and reduce soil productivity. Increased surface runoff and erosion would occur primarily in the short term and would decline in time due to natural stabilization. Increases in surface runoff would also depend on the success of mitigation measures.

Topsoil quality in the DFPA is generally fair with coarse fragment content, sand content, clay content, shallow topsoil depths, high erodibility, and droughtiness being the primary limitations to successful reclamation. Areas such as badlands have a very low reclamation potential with high clay and/or salinity concerns. In addition to these limitations, low annual precipitation and wind and water erosion could make successful reclamation more difficult to attain. Therefore, the overall potential for successfully stabilizing disturbed soils is poor to fair. Field reconnaissance and review of existing reclamation in the project area suggests that successful reclamation can be attained with aggressive reclamation measures and follow-up monitoring and remediation.

Since specific sites have not yet been identified for wells, pipelines, and roads, Table 3-11 indicates the likelihood of encountering soil limitations that would require special attention. A large portion of the project area would likely experience difficulties during revegetation due to the presence of excess sodium and/or clay in the soil. In addition, the droughty nature of the soils would further limit reclamation potential. Excessive areas of sand, clay, and wetness would be avoided by final siting choices.

Slopes rated slightly severe or greater occupy at least 11.4 percent (all badlands or 26,623.8 acres) and a much smaller percent of residual slopes and flats within the overall project area. In nearly half of the instances of severe slope, shallow depth to rock and/or high sand content may be anticipated as a further complication.

Indirect impacts from off-road use of vehicles include vegetal cover destruction, as well as rutting and compaction of the soil. Given the sensitivity of the soils indicated in Table 3-11, unauthorized off-road vehicle use should be restricted per BLM guidance.

These potential adverse impacts of the proposed project could reduce soil productivity, impair successful revegetation, and result in increased erosion potential. Successful revegetation through applied surface runoff, erosion, and sediment control measures, and effective revegetation efforts would reduce the potential for soil productivity loss. Soil erosion is likely to be a primary adverse impact of these project effects. Erosion can impede successful revegetation, result in a loss of site productivity, and impair water quality if eroded sediment is transported to surface water bodies. In addition, some soils and geologic units may have relatively high levels of selenium. Erosion of selenium-laden sediment could increase selenium loading of streams.

Existing literature estimates soil loss tolerance within the general area of the project at 1.5 t/ac/yr; losses exceeding this amount would lower soil productivity (USDI-BLM 1987). As discussed in Water Resources, Section 3.4.2.2. of Chapter 3, sediment delivery has been estimated by the BLM to be approximately 0.35 ac-ft per square mile per year or 1.4 t/ac/yr. The majority of sediment

delivery originates from erosion and degradation of stream channels as opposed to soil erosion from upland areas.

Given the potential importance of soil erosion, the Universal Soil Loss Equation (USLE) (USDA-FS 1980) was used to evaluate land management practices and the potential soil erosion in the DFPA for roads (Israelson et al. 1980) and other land management activities (USDA-FS 1980). According to the South Baggs DEIS (USDI-BLM 1999c), natural baseline erosion was estimated to be approximately 1.5 t/ac/yr. This is an environmentally conservative estimate, and the true natural baseline erosion rates are likely less than the value presented here. This magnitude correlates with the BLM's estimate of 1.4 t/ac/yr. Most of the predicted eroded soil is contained on-site and is not transported off-site to streams.

New project facilities would be constructed with surface runoff, erosion, and sedimentation controls in place that would reduce erosion rates. The effect of applying control measures to reduce erosion was investigated by Grah (1989) through the use of the USLE to demonstrate the feasibility of erosion reduction. Control measures include the use of mulch, water bars, water turnouts, and effective revegetation. Applying control measures and assuming a reasonable success rate of 60% for reclamation, erosion from newly disturbed areas could be reduced (from the average unmitigated erosion rate established in the South Baggs DEIS, USDI-BLM 1999c) to 1.5, 1.8, and 2.3 t/ac/yr in the first year for drill sites, pipelines, and roads, respectively. As discussed previously, erosion would continue to decrease due to effective reclamation, natural stabilization, and a maturing vegetal cover. By the fifth year after construction, erosion in reclaimed areas would likely be reduced to 0.2, 0.5, and 0.5 t/ac/yr for well, pipelines, and roads, respectively. Erosion reductions for well sites and roads would be less than reductions for pipelines since exposed earth material that comprise the surface of these features would continue to be exposed to erosion. These numbers suggest that soil erosion could be reduced to non-significant levels with application of aggressive reclamation following the control measures recommended in Appendix C.

Table 4-18 summarizes total erosion that could occur under this alternative. With the application of erosion control measures, total erosion from the Proposed Action would be approximately 9,711.1 tons per year after the first year of construction and 1,999.2 tons after the fifth year. The natural baseline rate of erosion would yield 7,384.5 tons per year. These estimates assume that all construction would occur in the first year of project authorization. As discussed in Chapter 2, project development would occur over a 30-50 year period. Therefore, the total estimated erosion would be distributed over this longer period of time and would be less than the environmentally conservative analysis.

Wind erosion could also be an adverse effect of project development given the dominant sandy texture of the soils in portions of the project area. Soil loss due to wind erosion could add to the water erosion estimates. Chronic and severe wind erosion could occur in limited areas where roads and/or pipelines traverse sandy soil areas. Because these areas are particularly susceptible to "blow outs," special efforts to avoid such areas should be applied. Where avoidance is not feasible, special erosion control and soil stabilization measures should be applied as discussed in Appendix C.

Of particular importance in regards to potential soil impacts would be soils with high water tables and/or surface inundation. Bearing strengths in these soils is generally low and facilities placed in such areas could be subjected to damage. Placement of project facilities would need to avoid these areas. In order to preclude significant impacts, roads, drill/well sites, and pipelines should

Table 4-18. Soil Erosion Rates and Total Erosion by Alternative.

		Erosion rates (t/ac/yr)*		
Facility	Area (acres)	Natural Baseline Rate of Erosion	Reclamation With Erosion Control: Year 1	Reclamation With Erosion Control: Year 5
Well Pads	-	1.5	1.5	0.2
Compressor Stations	-	1.5	1.5	0.2
Pipelines	-	1.5	1.8	0.5
Roads	-	1.5	2.3	0.5
Predicted Erosion (t/y)				
Proposed Action (t/y)				
Well Pad	1,444	2,166.0	2,166.0	288.8
Compressor Station	97	145.5	145.5	19.4
Pipelines	758	1,137.0	1,364.4	379.0
Roads	2,624	3,936.0	6,035.2	1,312.0
TOTAL	4,923	7,384.5	9,711.1	1,999.2
Alternative A (t/y)				
Well Pad	2,220	3,330.0	3,330.0	444.0
Compressor Station	161	241.5	241.5	32.2
Pipelines	1,166	1,749.0	2,098.8	583.0
Roads	4,035	6,052.5	9,280.5	2,017.5
TOTAL	7,582	11,373	14,950.8	3,076.7
Alternative B (t/y)				
Well Pad	**	**	**	**
Compressor Station	**	**	**	**
Pipelines	**	**	**	**
**Roads	**	**	**	**
**TOTAL	**	**	**	**

*Erosion rates from South Baggs DEIS (USDI-BLM 1999c).

** Determined as APD's are granted.

not be placed in areas with steep slopes greater than 25 percent and in areas with badland soils. Therefore, significant impacts are not expected to occur with implementation of the Proposed Action.

4.3.3.2 Alternative A

Under Alternative A, the DFPA would have a maximum of: 2,220 acres of new surface disturbance from well locations (including on-site gathering, measurement, and dehydration facilities); 833 miles (4,035 acres) of new roads or upgrades of existing roads, 555 miles (1,166 acres) of new pipeline- and approximately 161 acres of new surface disturbance from ancillary facilities (i.e., 6 compressor stations [24 acres], 2 gas processing plant [60 acres], 4 water evaporation ponds [16 acres], 3 disposal wells [21 acres], and 16 water wells [40 acres]). Total new short-term surface disturbance resulting from Alternative A would be 7,582 acres (approximately 3.2 percent of the project area).

Construction under Alternative A would variously disturb approximately 7,582 acres of soils. This total area of temporary disturbance would comprise approximately 3.2 percent of the 233,542 acre project area. Combined with the existing disturbance of 1,506.4 acres, total project area disturbance would be approximately 9,088.4 acres or 3.9 percent of the 233,542 acre project area. However, as discussed subsequently, this total area of temporary disturbance would be reduced through successful reclamation.

During the life of the project (30-50 years), total disturbances would be reduced to 3,300 acres (516 acres associated with 361 wells having 1.43 acres of remaining disturbance per well site, 2,623 acres of roads [this assumes a 65 percent drilling success rate with roads to unsuccessful wells being reclaimed] and 161 acres of surface disturbance associated with ancillary facilities) or approximately 1.4 percent of the project area.

Well pads would be reclaimed to the 1.4 acre of disturbance/well and remaining disturbed road dimensions would be approximately 16.0 feet wide, or 0.6 acres per well, and 0.0 acres for pipelines. The ancillary facility would not be reclaimed since the full size of the site would be needed during production. These remaining disturbance areas would represent approximately 3,300 acres or 1.4 percent of the total project area. This disturbance would be combined with the existing disturbance of approximately 1,506.4 acres for a total of 4,806.4 acres, or 2.1 percent of the project area.

The same types of soils impacts would occur under this alternative as with the Proposed Action. The amount and duration of such impacts would depend on the locations of the wells and access roads. As discussed previously, it would be very difficult to totally avoid all sensitive soil areas. Slopes greater than 25 percent, badland soils, and sandy soils should be totally avoided. Therefore, where the other sensitive soils cannot be avoided, special construction techniques and mitigation measures should be applied to reduce the probability of significant soils impacts.

Erosion rates would be essentially the same for this alternative as for the Proposed Action since the same types of construction activities would occur. However, total erosion would be increased due to the larger area of disturbance under this alternative. Table 4-18 summarizes total erosion that could occur under this alternative with and without erosion control measures. With the application of erosion control measures, total erosion under this alternative would be approximately 14,950.8 tons per year after the first year of construction and 3,076.7 tons after the fifth year. These estimates assume that all construction would occur in the first year of project authorization.

As discussed in Chapter 2, project development would occur over a 30-50 year period. Therefore, the total estimated erosion would be distributed over this period of time and would be less than the environmentally conservative analysis. These calculations suggest that soil erosion could be reduced to non-significant levels identified in the significance criteria with application of the control measures itemized in Appendix C. Therefore, significant impacts are not expected to occur with implementation of Alternative A.

4.3.3.3 Alternative B - No Action

Under the No Action Alternative, soils would be impacted similar to that described for the action alternatives, at levels previously authorized for Mulligan Draw and Dripping Rock, and on a case-by-case basis in other areas of the DFPA. Similar erosion, runoff, and sediment control and revegetation measures would be applied to minimize adverse impacts to soils. Such methods would likely reduce impacts of the No Action Alternative to non-significant levels.

4.3.4 Impact Summary

Implementation of the Proposed Action would affect 4,923 acres (2.6% of the total DFPA) of soils during project construction, while implementation of Alternative A would affect 7,582 acres (3.2% of the total DFPA) of soils. First year erosion levels would be approximately 9,711.1 tons for the Proposed Action and 14,950.8 tons for Alternative A, while fifth year erosion levels would decrease to 1,999.2 tons and 3,076.7 tons, respectively. This erosion would be in addition to the natural baseline erosion as well as the erosion occurring due to existing disturbance in the DFPA. These impacts would be kept to non-significant levels with application of the mitigation measures in Chapter 2 and the control measures recommended in Appendix C.

4.3.5 Additional Mitigation Measures

With measures identified in Chapter 2 and additional measures proposed in Chapter 4 (i.e. vegetation and wetlands, water resources), no additional mitigation measures for soils are required.

4.3.6 Residual Impacts

Given the application of the mitigation measures outlined in Section 2.5.2.11.2, no residual impact discussion is required. Impacts would remain the same as described in Section 4.3.3.

4.4 WATER RESOURCES

4.4.1 Introduction

Authorization of the proposed project would require full compliance with the GDRMP and GRRMP directives that relate to surface and groundwater protection, EO 11990 (floodplains protection), and the Federal CWA in regard to protection of water quality compliance with Section 404. These regulations require that certain permits/authorizations be obtained for project authorization including an NPDES permit for discharge of produced water; a surface runoff, erosion, and sedimentation control plan; an oil spill containment and contingency plan; and CWA Section 404 permits.

4.4.1.1 Surface Water

Potential impacts that could occur to the surface water system due to the proposed project include increased surface water runoff and off-site sedimentation due to soil disturbance (Soils Section 4.3), water quality impairment of surface waters, and stream channel morphology changes due to road and pipeline crossings. The magnitude of the impacts to surface water resources would depend on the proximity of the disturbance to a drainage channel, slope aspect and gradient, degree and area of soil disturbance, soil character, duration of time within which construction activities occur, and the timely implementation of effective mitigation measures. Impacts would likely be greatest shortly after the start of construction activities and would likely decrease in time due to stabilization, reclamation, and revegetation efforts. Construction activities would occur over a relatively short period of time; therefore, the majority of the disturbance would be intense but short-lived. A Spill Prevention, Control, and Countermeasure Plan would be implemented to prevent petroleum products and other chemicals from contaminating surface waters. If deemed necessary, reserve and evaporative pits would be lined to prevent drilling fluids and produced water from contaminating surface waters.

4.4.1.2 Groundwater

The proposed state-of-the-art drilling and completion techniques make it unlikely that aquifer contamination would occur during drilling. Should aquifer mixing occur, the magnitude of mixing would be relatively small due to the relatively short period of time drilling is conducted. A Spill Prevention, Control, and Countermeasure Plan would be implemented to prevent petroleum products and other chemicals from contaminating groundwater aquifers. If deemed necessary, reserve and evaporative pits would be lined to prevent drilling fluids and produced water from contaminating aquifers.

4.4.2 Impact Significance Criteria

Impacts would be considered to be significant if the following were to occur:

- Non-compliance with the GDRMP (USDI-BLM 1990a), and the GRRMP (USDI-BLM 1997). Specifically, surface development would be prohibited within 500 feet of live streams, lakes, reservoirs, canals, and associated riparian habitat;
- Non-compliance with EO 11990, Protection of Floodplains.
- Degradation of water quality such that state standards outlined in the Rules and Regulations of the WQED-WQD are not met.
- Degradation of groundwater quantity in any freshwater aquifers regardless of use or non-use.
- Degradation of groundwater quality in any freshwater aquifers regardless of use or non-use.
- Alteration of channel geometry or gradients that produce undesirable effects such as aggradation, degradation, or side-cutting.

- Modification of the quantity and quality of streamflows such that it affects established users.
- Non-compliance with the CWA in regard to water quality and Section 404 permits.

4.4.3 Direct and Indirect Impacts

4.4.3.1 Proposed Action

4.4.3.1.1 Surface Water

The proposed project activities would result, to varying degrees, in the following impacts: vegetation removal, increased soil surface exposure, mixing of soil horizons, soil compaction and decreased infiltration capacity, loss of topsoil productivity, and increased susceptibility of the soil to wind and water erosion. These impacts may affect surface water resources by increasing surface runoff, erosion, and off-site sedimentation, which in turn would cause channel instability and degradation of surface water quality. As described in Chapter 2, total new short-term surface disturbance resulting from the Proposed Action would be 4,923 acres (approximately 2.1 percent of the total DFPA, which encompasses about 233,542 acres). This total would include 1,444 acres of new surface disturbance from well locations (including on-site gathering, measurement, and dehydration facilities), 2,624 acres of new roads or upgrades of existing roads, 758 acres of new pipeline construction, and approximately 97 acres of new ancillary facilities (i.e., four compressor stations on 16 acres, one gas processing plant on 30 acres, three water evaporation ponds on 12 acres, two disposal wells on 14 acres, and ten water wells on 25 acres). These disturbance areas are summarized in Table 4-18 of Section 4.3. The construction disturbance would not be uniformly distributed across the project area, but rather, project facilities would be located where the efficiency and feasibility of extracting the natural gas would be the highest. Combined with the existing disturbance of 1,506.4 acres, cumulative disturbance would be approximately 6,429.4 acres or 2.8 percent of the project area. However, as discussed subsequently, this total area of temporary disturbance would be reduced through successful reclamation.

The Proposed Action assumes the construction of 385 wells at 361 locations and associated roads and pipelines. Roads would be designed to minimize disturbance, and all surface disturbance would be contained within the road ROW. In the event drilling is non-productive, all disturbed areas, including the well site and new access road, would be reclaimed to the approximate landform that existed prior to construction. If drilling is productive, all access roads to the well site would remain in place for well servicing activities. Partial reclamation would be completed on segments of the well pad and access road ROW no longer needed. During the life of the project (30-50 years) total disturbances would be reduced to 2,139 acres (336 acres associated with 235 well sites having 1.4 acres of remaining disturbance per well site, 1,706 acres of roads [this assumes a 65 percent drilling success rate with roads to unsuccessful wells being reclaimed] and 97 acres of surface disturbance associated with ancillary facilities) or approximately 0.92 percent of the 233,542-acre project area. This disturbance would be combined with the existing disturbance of approximately 1,506.4 acres for a total of 3,645.4 acres, or 1.6 percent of the project area.

Of the 233,542 acres of land within the DFPA, most (154,104.2 acres or 66 percent) fall into a sensitive soils category in regard to topsoil depth and quality, with limitations to road and facilities construction, rapid to very rapid runoff potential, and severe to very severe wind and water erosion potential. The balance (79,437.8 acres or 34 percent) are non-sensitive soils. Table 3-11 provides

an approximate breakdown of sensitivity by category, nature or sensitivity, and area. Sensitive soils include physical characteristics that relate to watershed stability, runoff potential, erosion potential, and surface runoff rates. By avoiding areas containing sensitive soils, the likelihood of causing significant impacts is reduced.

Topsoil quality in the DFPA is generally fair with coarse fragment content, sand content, clay content, shallow topsoil depths, high erodibility, and droughtiness being the primary limitations to successful reclamation. Areas such as badlands have a very low reclamation potential with high clay and/or salinity concerns. In addition to these limitations, low annual precipitation and wind and water erosion could make successful reclamation in the DFPA more difficult to attain. However, field reconnaissance and review of existing reclamation in the project area suggests that successful reclamation can be attained with aggressive reclamation measures and follow-up monitoring and remediation.

Since specific sites have not yet been identified for wells, pipelines, and roads, Table 3-11 indicates the likelihood of encountering soil limitations that would require special attention. A large portion of the DFPA would likely experience difficulties during revegetation due to the presence of excess sodium and/or clay in the soil.

Slopes rated slightly severe or greater are likely to be encountered in the badlands and may be encountered elsewhere to a lesser extent within the project area. In nearly half of the instances of severe slope, shallow depth to rock and/or high sand content may be anticipated as a further complication.

Sediment delivery has been estimated by the BLM to be approximately 0.35 ac-ft per square mile per year or 1.4 t/ac/yr. The majority of sediment delivery originates from erosion and degradation of stream channels as opposed to soil erosion from upland areas. According to the South Baggs EIS (USDI-BLM 1999c), natural baseline erosion was estimated to be approximately 1.5 t/ac/yr. This is an environmentally conservative estimate, and the true natural baseline erosion rates are likely less than the value presented here. This magnitude correlates with the BLM's estimate of 1.4 t/ac/yr. Most of the predicted eroded soil is contained on-site and is not transported off-site to streams. The majority of soil disturbance would not be in proximity to stream channels as required by the RMP directive identified in Section 4.4.2.

According to the South Baggs EIS, the average unmitigated erosion rate could be as high as 13.8t/ac/yr for drill pads, 73.7 t/ac/yr for pipelines, and 5.8 t/ac/yr for roads. New project facilities would be constructed with surface runoff, erosion, and sedimentation controls in place that would reduce erosion rates. The effect of applying control measures to reduce erosion was investigated by Grah (1989) through the use of the USLE to demonstrate the feasibility of erosion reduction. Control measures include the use of mulch, water bars, water turnouts, and effective revegetation. Applying control measures and assuming a reasonable success rate of 60% for reclamation, erosion from newly disturbed areas could be reduced to 1.5, 1.8, and 2.3 t/ac/yr in the first year for drill sites, pipelines, and roads, respectively. As discussed previously, erosion would continue to decrease due to effective reclamation, natural stabilization, and a maturing vegetal cover. By the fifth year after construction, erosion would likely be reduced to 0.2, 0.5, and 0.5 t/ac/yr for well, pipelines, and roads, respectively with reclamation. This represents a 98 percent reduction for well sites, a 99 percent reduction for pipelines, and a 91 percent reduction for roads. Erosion reductions for well sites and roads would not decrease as much as for pipelines since exposed earth material that comprise the surface of these features would continue to be exposed to erosion.

These calculations suggest that soil erosion could be reduced to non-significant levels identified in the significance criteria with application of aggressive reclamation following the control measures recommended in Appendix C.

Table 4-18 summarizes the total erosion that could occur under this alternative. With the application of erosion control measures, total erosion from the Proposed Action would be approximately 9,711.1 tons per year after the first year of construction and 1,999.2 tons after the fifth year. These estimates assume that all construction would occur in the first year of project authorization. As discussed in Chapter 2, project development would occur over a 20-year period. Therefore, the total estimated erosion would be distributed over this longer period of time and would be less than the environmentally conservative analysis.

As discussed in Chapter 3, most of the sediment yield originates from channel erosion and degradation due to infrequent high-intensity thunderstorm events. Even though this sediment delivery analysis indicates that sediment transport to a channel would likely be small, this sediment input combined with potential minor increases in surface runoff could increase the rate of channel sedimentation. Therefore, even with the predicted small quantity of sediment transport, such sediment must be managed in these sensitive watersheds by restricting all sediment to the site of erosion through the implementation of best management practices and mitigation.

Most of the ephemeral drainage channels identified on Figure 3-5 are classified as Waters of the U.S. Crossings of these channels and any associated wetlands would require authorization from the COE through the CWA Section 404 permitting process. However, these channel crossings would likely receive expedited authorization from the COE through General Permit 98-08, which authorizes activities associated with oil and gas exploration and development in the State of Wyoming. Other project facilities such as well sites and/or facilities sites would not be located in waters of the U.S., and therefore, Section 404 permitting would not be necessary for such facilities. No significant impacts would likely result given the assumptions and compliance with management identified previously, as well as the mitigation measures listed in Section 4.4.5.

There is a remote chance that road and pipeline construction across established channels could adversely modify flow hydraulics. However, with correct design of channel crossings, including design for 50-year runoff events, no adverse impacts are expected. As discussed in Chapter 3, most of the drainage channels in the project area are ephemeral. Therefore, it is unlikely that the quality of surface waters would be adversely affected by increased sedimentation. However, some increase in sediment discharge into the existing detention ponds (i.e., small stock reservoirs) within the project area could occur. This could result in loss of storage capacity of the ponds. The erosion analysis indicates that with successful implementation of control measures, no significant increase in channel sedimentation should occur. Thus, the storage capacity of the ponds should not be adversely impacted. There is a greater chance that a pond would be filled in with sediment from natural erosion processes, and to separate natural process sedimentation from human-induced sedimentation is beyond the scope of this EIS. If it were determined that the project causes loss of storage capacity or reduction in water quality, the operators would be required to compensate the water right holders by excavating the collected sediment in the pond and/or provide better quality water during the occurrence of the adverse impact. Most of the project could be constructed without adverse affect on water resources except in areas where project facilities cannot avoid sensitive soils areas as discussed in Section 4.3.

Reserve pits would be utilized to contain drilling fluids, cuttings, and wastewater produced from the well drilling operations. If necessary, the reserve pit would be lined with an impermeable liner to prevent seepage and possible contamination of surface and groundwater. As discussed in Section 4.3, many of the soils in the project area have a clay texture with low infiltration and permeability rates. Therefore, not all reserve pits may require impermeable liners to prevent seepage. An impermeable membrane liner would be used where appropriate as defined during the APD review. The impermeable synthetic liner would be at least 12 mils thick, reinforced with a bursting strength of 174 x 175 pounds per inch (ASTMD 75719), resistant to decay from sunlight and hydrocarbons, and compatible with the drilling fluids to be retained. Leakage of the pit fluids would be minimal unless the liners were damaged. Thus, adverse impacts from reserve pits would likely not occur.

As described in Chapter 2, water would be required in most aspects of project construction including road construction, drill site construction, well drilling, and pipeline testing. Water for use in the project construction could be as high as 1,000 gallons per acre of disturbance, which would equate to about 15.1 ac-ft of water. Water used in the well-drilling process could be as high as 462,000 gallons, or about 1.4 ac-ft of water per well for a total of about 546 ac-ft (for 385 wells). The operators intend to use freshwater-based mud for the majority of their drilling operations. Water would also be used for hydrostatic testing of pipelines. Assuming one set of pipelines per well pad (single or multiple wells), and all pipelines associated with 361 well pads (1,906,080 feet of pipeline) would be hydrostatically tested at once and therefore water would not be re-used, approximately 15.4 ac-ft of water would be required for hydrostatic testing of pipelines. Therefore, total water demand with hydrostatic testing for the Proposed Action would be approximately 576.5 ac-ft. This total quantity of water would not be withdrawn all at one time; rather, this amount would be distributed over the construction phase that would extend over several years as discussed in Chapter 2. Water would be obtained from SEO-approved local surface water sources and/or water wells. As described in Chapter 3, there are presently 33 active permitted groundwater rights filed in the project area, 15 of which are for water wells that supply water for drilling deep oil and gas wells. There are over 120 cancelled and/or abandoned groundwater rights within the project area, essentially all of which were water wells used to supply water for oil and gas drilling. Seventeen of the other 18 active permitted groundwater rights in the project area are designated for livestock use. There are approximately 60 surface water right permits within the project area; all but 2 of which are associated with livestock water facilities. Roughly two-thirds of these permits are unadjudicated and the other third are adjudicated. These surface water rights total about 326 ac-ft per year. Historically, water wells have been the primary source of supply for oil and gas drilling in this arid area; it is likely that water wells would supply the proposed project drilling needs. The total water demand identified above would not likely adversely affect the existing surface water or groundwater rights in the project area provided full coordination is implemented with the SEO and the BLM. Again, the total water demand of 576.5 ac-ft by the project would be spread out over several years and would not cause significant adverse impacts on the surface water or groundwater resources within the DFPA.

Handling and management of hydrostatic test water, if used by the operators, would need to be accomplished in a manner that does not adversely affect soils, stream channels, and surface water and groundwater quality. After testing operations are completed, the water would be pumped into water-hauling trucks and transported to drilling locations within the project area to be used in conjunction with drilling operations or re-used for other aspects of the construction and/or production process. However, if such water is not re-used it must be disposed of in a manner where soil scouring and water quality impairment would not result. Hydrostatic test water is expected to be of relatively good quality; however, it should be evaluated for compliance with State

water quality standards. No test water should be discharged unless such water meets these standards. Test water not needed for drilling operations that meets water quality standards would be disposed of onto undisturbed land having vegetative cover or into an established drainage channel in a manner as not to cause accelerated erosion. Further, use and disposal of hydrostatic test water must comply with the mandatory ROW stipulation for hydrostatic testing as well as the POD, the CWA and the NPDES permit that would be required for the proposed project.

Methods used for the disposal of produced water (water produced in association with the gas which is separated out at the well location) would vary but would generally be accomplished by either (1) disposal in an underground injection well, (2) surface discharge, or (3) surface evaporation in lined or unlined ponds. The operators would obtain the permit(s) necessary (i.e., NPDES) for the selected disposal method. Depending on timing of availability, quantity, and quality of produced water; some of the produced water could be used in well drilling and completion, and pipeline construction and hydrostatic testing.

If a well is productive, site erosion and off-site sedimentation would be controlled by promptly revegetating sites in the first appropriate season (fall or spring) after drilling, and providing surface water drainage controls, such as berms, sediment collection traps, diversion ditches and erosion stops as needed. These measures would be described in the individual APD/ROW.

4.4.3.1.2 Groundwater

The geologic formation targeted in the DFPA is the Almond Formation. Drilling depths would vary from 9,800 to13,000 feet. Well drilling and completion should not have an adverse effect on groundwater quality if the project is in compliance with "Onshore Oil and Gas Order No. 2." State-of-the-art drilling and well completion techniques make the possibility of significant degradation of groundwater quality in any aquifer very low.

Well completion must be accomplished in compliance with "Onshore Oil and Gas Order No. 2" (43 CFR § 3164.1). These guidelines specify the following:

> "Proposed casing and cementing programs shall be conducted as approved to protect and/or isolate all usable water zones, potentially productive zones, lost circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals. Any isolating medium other than cement shall receive approval prior to use".

Usable water is defined by the onshore order as groundwater with a TDS of 10,000 ppm or less encountered at any depth (the State of Wyoming considers TDS of 5,000 ppm to be the limit on livestock use). To comply with the order, wells must be completed such that unusable water is isolated from usable water through the use of cementing and other proven technologies. Assuming compliance with this order, no contamination of usable groundwater would likely occur. Well drilling and completion as proposed in Chapter 2 appears to comply with the onshore order.

As discussed in Chapter 3, the SEO records identify 33 active permitted groundwater rights in the project area, 15 of which are for water wells that supply water for drilling deep oil and gas wells. The BLM is the applicant of 17 of the other 18 groundwater rights in the project area, 5 of which are developed springs. All 17 are designated for livestock use. Only 1 of the 33 groundwater rights is for domestic use. The majority of groundwater in use in the DFPA is obtained from Tertiary age units. This, combined with the improbable degradation of groundwater quality would essentially

eliminate the potential occurrence of adverse impacts to any groundwater right holders near the DFPA.

It is unlikely that seeps or springs would be adversely affected by the Proposed Action, as these water features are typically associated with shallow geologic units. However, locations of such surface water expressions of groundwater would be evaluated during the site-specific analysis conducted for all project components at the APD stage. All construction activities and storage of petroleum products would be kept away from seeps and springs. Therefore, contamination of seep and springs and groundwater would be unlikely.

4.4.3.2 Alternative A

The same types of adverse impacts discussed under the Proposed Action would occur under this alternative; however, the magnitude of such impact would be slightly greater. Projected short-term disturbances under this alternative would be increased to approximately 7,582 acres. These disturbance areas would represent approximately 3.2 percent of the total 233,542 acre project area. This total would include 2,220 acres of new surface disturbance from well locations (including on-site gathering, measurement, and dehydration facilities), 4,035 acres (833 miles) of new roads or upgrades of existing roads, 1,166 acres (555 miles) of new gas gathering pipelines, and 161 acres for ancillary facility sites. Combined with the existing disturbance of 1,506.4 acres, cumulative disturbance would be approximately 9,088.4 acres or 3.9 percent of the 233,542 acre project area.

However, this total area of temporary disturbance would be reduced through successful reclamation.

During the life of the project (30-50 years), total disturbances would be reduced to 3,300 acres (516 acres associated with 361 wells having 1.43 acres of remaining disturbance per well site, 2,623 acres of roads [this assumes a 65 percent drilling success rate with roads to unsuccessful wells being reclaimed] and 161 acres of surface disturbance associated with ancillary facilities) or approximately 1.4 percent of the 233,542 acre project area. This disturbance would be combined with the existing disturbance of approximately 1,506.4 acres for a total of 4,806.4 acres, or 2.1 percent of the project area.

The construction disturbance associated with Alternative A can also be distributed by the watershed. The Sand Creek watershed would sustain most of the 7,582 acres of disturbance. Assuming all of the projected disturbance was to occur within the Sand Creek watershed, this would equate to only about 2 percent of that drainage basin. Likewise, assuming all of the projected disturbance was to occur within the Barrel Springs Draw watershed, this would equate to only about 3.5 percent of that drainage basin.

The same types of soils impacts would occur under this alternative as with the Proposed Action. The amount and duration of such impacts would depend on the locations of the wells and access roads. As discussed previously, it would be very difficult to totally avoid all sensitive soil areas. Slopes greater than 25 percent, badland soils, and sandy soils should be totally avoided. Therefore, where the other sensitive soils cannot be avoided, special construction techniques and mitigation measures should be applied to reduce the probability of significant soils impacts.

Erosion rates would be essentially the same for this alternative as for the Proposed Action since the same types of construction activities would occur. However, total erosion would be increased due to the larger area of disturbance under this alternative. Table 4-18 summarizes total erosion that could occur under this alternative with and without erosion control measures. With the application of erosion control measures, total erosion under this alternative would be approximately 14,950.8 tons per year after the first year of construction and 3,076.7 tons after the fifth year. These estimates assume that all construction would occur in the first year of project authorization. As discussed in Chapter 2, project development would occur over a 20-year period. Therefore, the total estimated erosion would be distributed over this period of time and would be less than the environmentally conservative analysis. These calculations suggest that soil erosion could be reduced to non-significant levels identified in the significance criteria with application of the control measures itemized in Appendix C. Therefore, significant impacts are not expected to occur with implementation of Alternative A.

Total water demand with hydrostatic testing for this alternative would be approximately 886 ac-ft. Water would be obtained from SEO-approved local surface water sources and/or water wells. The source of water for the proposed project would likely be, as it has been in the past, primarily from water supply wells. The total water demand identified above would not likely adversely affect the existing surface water or groundwater rights in the project area provided full coordination is implemented with the SEO and the BLM. Again, the total water demand of 886 ac-ft by the project would be spread out over several years and would not cause significant adverse impacts on the surface water or groundwater resources within the DFPA.

The analysis and discussion presented under the Proposed Action, Section 4.4.3.1, in regard to the discharge of hydrostatic test water, lining of reserve and evaporative pits, use of oil-based drilling muds, potential impacts on seeps and springs, compliance with "Onshore Order No. 2", contamination of groundwater, impairment of surface water quality, destabilization of channels, and the management of produced water are applicable to this alternative.

4.4.3.3 Alternative B – No Action

Under the No Action Alternative, water resources would continue to be impacted at levels previously authorized for Mulligan Draw and Dripping Rock and as additional individual APD's are granted by the BLM. Water resources impacts would be similar to those described above. In terms of magnitude, such impacts would likely be considerably less than for the Proposed Action.

4.4.4 Impacts Summary

Most adverse impacts to water resources would be avoided or reduced through implementation of control measures identified in Chapter 2 and mitigation measures listed in this section. The Proposed Action would result in a disturbance of 4,923 acres (approximately 2.1 percent of the DFPA) over a period of approximately 20 years. During the LOP (30-50 years), total disturbances would be reduced to approximately 2,139 acres (approximately 0.91 percent of the DFPA). Alternative A would result in a disturbance of 7,582 acres (approximately 3.2 percent of the DFPA) over a period of approximately 20 years. During the Alternative A LOP (30-50 years), total disturbances would be reduced to approximately 3,300 acres (approximately 1.40 percent of the DFPA). Alternative B - No action, under which individual APD's could continue to be approved by

the BLM, would result in impacts approaching the magnitude of the Proposed Action. However, there would be an increased probability of occurrence of unexpected adverse impacts since overall project development would not happen in a well-planned manner.

Impacts resulting from drill pad, access road, facility site, and pipeline ROW construction could include removal of vegetation, exposure of the soil, mixing of soil horizons, soil compaction, loss of topsoil productivity, and increased susceptibility of the soil to wind and water erosion. These impacts could increase runoff, erosion, and off-site sedimentation. Total erosion that could result from the proposed project after the first year of construction with effective erosion control would be approximately 9,711.1 tons for the Proposed Action and 14,950.8 tons for Alternative A. After five years, erosion levels would decrease to 1,999.2 tons and 3,076.7 tons, respectively, with erosion control. This erosion would be in addition to the natural baseline erosion as well as the erosion occurring due to existing disturbance in the DFPA. Although the majority of the project area is classified as sensitive soil and such areas cannot be totally avoided, particular attention would be given to avoiding steep slopes greater than 25 percent, badlands, sandy soils, and soils with high water tables and/or which are subject to inundation and thus, minimize the chance of a significant impact. These impacts could be kept to non-significant levels with application of the mitigation measures in Chapter 2 and the control measures recommended in Appendix C.

As identified previously, authorization of the Proposed Action would require full compliance with RMP management directives that relate to surface and groundwater protection, EO 11990 (floodplains protection), and the CWA in regard to protection of water quality and compliance with Section 404. These regulations require that certain permits/authorizations be obtained for project authorization including an NPDES permit; a surface runoff, erosion, and sedimentation control plan; an oil spill containment and contingency plan; and CWA Section 404 permits. Most of the ephemeral drainage channels identified on Figure 3-5 are classified as Waters of the U.S. and are often associated with jurisdictional wetlands. Crossings of these channels and associated wetlands would require authorization from the COE through the CWA Section 404 permitting process. However, these channel crossings would likely receive expedited authorization from the COE through General Permit 98-08. Other project facilities such as well sites and/or facilities sites could not be located in Waters of the U.S. and therefore, Section 404 permitting would not be necessary for such facilities. Each individual channel crossing would be reviewed during the APD/ROW permitting process for specific permit requirements under Section 404 of the CWA. No significant impacts would likely result given the assumptions and compliance with management direction identified previously.

The Operators propose to completely reclaim all disturbed areas not needed for production activities including: (1) pipeline ROW, (2) portion of road ROW not needed in the function of the road, and (3) the portion of the drill pad not needed during production. Reclamation would generally include: (1) complete cleanup of the disturbed areas; (2) restoration of the disturbed areas to the approximate ground contour that existed prior to construction; (3) ripping of disturbed areas to a depth of 12 to 18 inches; (4) replacement of topsoil over all disturbed areas; (5) seeding of reclaimed areas with the seed mixture prescribed in the Surface Use Plan or Plan of Development for the proposed Action; and (6) fertilizing, if considered necessary by the BLM officer.

4.4.5 Additional Mitigation Measures

With measures identified in Chapter 2, no additional mitigation measures for water resources are required.

4.4.6 Residual Impacts

Given the application of the mitigation measures outlined in Section 2.5.2.11.2 and considering that no additional mitigation measures are proposed, no residual impact discussion is required. Impacts would remain the same as described in Section 4.4.3.

4.5 VEGETATION AND WETLANDS

4.5.1 Introduction

Direct impacts would include the short-term loss of vegetation (modification of structure, species composition, and areal extent of cover types) due to soil disturbance and grading activities. Indirect impacts would include the short-term and long-term increased potential for non-native species invasion, establishment, and expansion; exposure of soils to accelerated erosion; shifts in species composition and/or changes in vegetative density; reduction of wildlife habitat; and changes in visual aesthetics.

4.5.2 Impact Significance Criteria

The following criteria were used to determine the significance of construction and operation of the proposed project on vegetation resources within the DFPA. These criteria were developed based on management directives, professional judgement, involvement in other NEPA projects throughout the West, and state regulations (e.g., the Wyoming Noxious Weed Act).

- non-compliance with management directives for the RFO and RSFO administrative areas;
- removal of vegetation such that following reclamation, the disturbed area(s) would not have adequate cover (density) and species composition (diversity) to support pre-existing land uses, including wildlife habitat, within a period of five years for general vegetation types or within two years for riparian and wetland areas;
- unauthorized discharge of dredged and/or fill materials into or excavation of waters of the U.S., including special aquatic sites, wetlands, and other areas subject to the federal Clean Water Act, EO 11988 (flood plains) and EO 11990 (wetlands and riparian zones);
- reclamation is not accomplished in compliance with EO 13112 (Invasive Species);
- introduction and establishment of noxious or other undesirable invasive, non-native plant species to the degree that such establishment results in listed invasive, non-native species occupying any undisturbed rangeland outside of established disturbance areas or hampers successful revegetation of desirable species in disturbed areas;

- removal or disturbance of special status plants (or habitat judged important for survival) to the extent that such impact would threaten the viability of the local population and/or induce an upgrade in the federal, state, or resource area status.

4.5.3 Direct and Indirect Impacts

4.5.3.1 Proposed Action

Vegetation removal and soil handling associated with the construction and installation of well pads, pipelines, access roads, and other facilities as described in Chapter 2 would affect vegetation resources both directly and indirectly. Direct impacts would include the short-term loss of vegetation (modification of structure, species composition, and areal extent of cover types). Indirect impacts would include the short-term and long-term increased potential for non-native species invasion, establishment, and expansion; exposure of soils to accelerated erosion; shifts in species composition and/or changes in vegetative density; reduction of wildlife habitat; reduction in livestock forage; and changes in visual aesthetics.

The proposed action would have short-term surface disturbance of 4,923 acres (approximately 2.1 percent of the DFPA). During the LOP (30-50 years), total disturbances would be reduced to 2,139 acres or approximately 0.92 percent of the project area.

Assuming all locations are productive, the area of impact under the Proposed Action would be reduced (upon successful reclamation) to 2,139 acres. The likelihood of impact is greatest for the primary vegetation cover types of Wyoming big sagebrush, desert shrub, and basin exposed rock/soil types which occupies 83.8 percent of the project area. Except for habitats occupied by plant species of concern, clearing of upland cover types would not be significant because upland cover types are generally abundant and widely distributed throughout the region and/or have been previously impacted (e.g., disturbed land).

Construction activities, increased soil disturbance, and higher traffic volumes could spur the introduction and spread of undesirable and invasive, non-native species within the DFPA. Non-native species invasion and establishment has become an increasingly important result of previous and current disturbance in southwest Wyoming. The project area is relatively free of noxious and other unwanted invasive, non-native species. These species often out-compete desirable species, including species of concern, rendering an area less productive as a source of forage for livestock and wildlife. Additionally, sites dominated by invasive, non-native species often have a different visual character that may negatively contrast with surrounding undisturbed vegetation. However, with implementation of best management practices and proposed mitigation measures, including non-native species establishment and invasion monitoring and remediation, no significant impacts are anticipated.

Potential impacts to waters of the U.S., including wetlands and other special aquatic sites, could include clearing, excavating, filling, and grading. Such impacts would reduce the area and functional values offered by an affected cover type. Specific project impacts on waters of the U.S. cannot be accurately assessed since facility locations have not been identified. However, waters of the U.S. comprise less than one percent of the DFPA. Given this occurrence and distribution, well sites would be located to avoid wetlands. Road and pipeline facilities, however, might affect a small amount (estimated < 5 acres) of wetlands where such facilities cannot be located to avoid wetlands. Given implementation of mitigation measures, as well as compliance with the RMP, the

CWA, and Executive Orders 11990 and 11989, the probability of significantly impacting waters of the U.S. is low. As such, no significant impacts are anticipated. Road and pipeline crossings would likely be authorized under COE Nationwide Permits 12 (pipelines) or 14 (roads) or under Wyoming General Permit (GP) 98-08, developed by the COE to be used statewide for all types of oil and gas activities related to both exploration and production (Johnson 2001). BLM has the authority under this general permit (but is not required) to determine if the permit is applicable to activities that are under their jurisdiction. In some cases, GP 98-08 is more restrictive than Nationwide Permits 12 and 14 (e.g., advance notification required for any crossing that impacts more than 0.10 acre). BLM is allowed to approve any activity up to the full limit of GP 98-08. However, the permittee must send a Statement of Compliance to the COE documenting what was done within 30 days after completion for activities that impact over 0.10 acre. This topic is further addressed in the Mitigation discussion.

4.5.3.2 Alternative A

Under Alternative A, the DFPA would have a maximum of: 2,220 acres of new surface disturbance from well locations (including on-site gathering, measurement, and dehydration facilities); 833 miles (4,035 acres) of new roads or upgrades of existing roads, 555 miles (1,166 acres) of new pipeline- and approximately 161 acres of new surface disturbance from ancillary facilities (i.e., 6 compressor stations [24 acres], 2 gas processing plant [60 acres], 4 water evaporation ponds [16 acres], 3 disposal wells [21 acres], and 16 water wells [40 acres]). Total new short-term surface disturbance resulting from Alternative A would be 7,582 acres (approximately 3.2 percent of the project area).

During the life of the project (30-50 years), total disturbances would be reduced to 3,300 acres (516 acres associated with 361 wells having 1.43 acres of remaining disturbance per well site, 2,623 acres of roads and 161 acres of surface disturbance associated with ancillary facilities) or approximately 1.0 percent of the project area.

Larger acres of construction impacts would occur to all vegetation cover types, including wetlands and other special aquatic sites, under Alternative A. Production phase impacts would include well locations, compressor station, pipelines, and roads. As with the Proposed Action, the amount and duration of such impacts would depend on the locations of the wells and access roads. The likelihood of impact is still greatest for the primary vegetation cover types of Wyoming big sagebrush, desert shrub, and basin exposed rock/soil types which occupy 83.8 percent of the DFPA.

Impacts would likely be higher under Alternative A than for the Proposed Action given the greater area of land that would be affected. The stipulations prescribed in the Great Divide RMP (USDI-BLM 1990a), Green River RMP (USDI-BLM 1997), and measures committed to by the Operators (Chapter 2) would preclude significant impacts to vegetative resources for reasons identified previously.

4.5.3.3 Alternative B - No Action

Under the No Action Alternative, vegetation would continue to be impacted at levels previously authorized for Mulligan Draw and Dripping Rock and as individual APD's are granted by the BLM. Loss of upland cover types would not be significant. If present, impacts to wetlands would be assessed and mitigated on a case-by-case basis similar to the action alternatives. Rare plant surveys would continue to be performed prior to surface disturbance activities associated with

individual projects. Invasive, non-native species programs would be implemented per stipulations in individual APD's.

4.5.4 Impacts Summary

Implementation of the Proposed Action would initially affect 4,923 acres (2.1 percent of the project area) of various vegetation cover types, during project construction. Reclamation efforts during well production would reduce impacts to 2,139 acres or 0.92 percent of the project area.

Impacts to vegetation would include removal of cover types (potential to decrease diversity and density of desirable species) and the increased potential for noxious weed invasion and establishment. Associated effects of such loss on wildlife, visual resources, and land use are discussed under those headings. Except for waters of the U.S. (including wetlands and other special aquatic sites) and/or plant species of concern and their habitat, a reduction in vegetation density would not be significant because upland vegetation types are relatively common, cover large areas, have wide distribution, and occur with high frequency within the project area as well as on other lands within the Washakie Basin. (See cumulative impacts for a discussion on the impact to vegetation cover types relative to existing disturbance in the DFPA and to projects within this larger context area.)

Monitoring for, and establishment of, invasive, non-native species and prompt and aggressive remediation, as provided for in Chapter 2, would prevent further invasive, non-native species invasion/establishment problems and facilitate successful revegetation of disturbed areas.

Project implementation could potentially impact the area and functions of wetlands, special aquatic sites, and other waters of the U.S. Direct impacts could occur through filling, grading, and excavation; indirect impacts could occur through hydrologic modification, sedimentation, pollution, and disturbance. Due to the larger area of disturbance associated with road/pipeline ROW facilities, Alternative A would be more likely to affect waters of the U.S. than the other alternatives. However, measures imposed by the RMP (USDI-BLM 1990a) and 404 permitting process would prevent or avoid impacts to jurisdictional wetlands and other special aquatic sites. Further, compliance with Section 404(b)(1) guidelines would remove the potential for significant impacts under all alternatives.

All alternatives have potential to affect plant species of concern or habitat for such species. However, given implementation of Chapter 2 measures, no significant impacts are anticipated. No listed plant species or species proposed for listing under the ESA would be impacted as none occur in the project area.

The duration and magnitude of impacts to vegetation cover types would depend on the locations of well sites and access roads, the success of mitigation and revegetation efforts. It is not realistic to consider that sites would be returned to predisturbance conditions in terms of diversity but can meet predisturbance cover and production. In terms of successful site stabilization, necessary time should be on the magnitude of 3-5 years. Revegetation success would depend on the amount and quality of topsoil salvaged, length of time stockpiled, and respread depth over disturbed areas, as well as seed quality and post-seeding invasive, non-native species control efforts.

Reclamation would be accomplished according to a site-specific reclamation and revegetation plan that uses best-management practices. Revegetation would involve the use of plant materials that

meet specific reclamation objectives in terms of soil erosion control; soil protection, stabilization, and fertilization; aesthetics; and compatibility with native vegetation adjacent to the disturbance area. Native species would be utilized according to BLM policy. In spite of the poor to fair reclamation potential for many soils (see discussion under Soils, Section 3.5), technology exists to stabilize sites and return disturbed areas to predisturbance cover and production conditions in the time frame indicated by the significance criteria.

4.5.5 Additional Mitigation Measures

With measures identified in Chapter 2, no additional mitigation measures are required.

4.5.6 Residual Impacts

Given the application of the mitigation measures outlined in Section 2.5.2.11.2 and considering that no additional mitigation measures are proposed, no residual impact discussion is required.

4.6 RANGE RESOURCES AND OTHER LAND USES

4.6.1 Introduction

Impacts to range resources and other land use would result from Proposed Action-related activities, traffic, and the disturbance of soils and vegetation during drilling and construction of access roads, gathering lines and ancillary facilities.

4.6.2 Impact Significance Criteria

Impacts to range resources and other land use would be significant if Proposed Action-related activities were not in compliance with the management objectives outlined in the Great Divide RMP (USDI-BLM 1987, 1988a, and 1990a) and the Green River RMP (USDI-BLM 1992a, 1996a, and 1997).

- To enhance livestock grazing while maintaining a balance between economic uses and the enhancement of wildlife habitat, watershed, and riparian areas, and while maintaining or improving range conditions over the long term (Great Divide RMP).

- To improve forage production and ecological conditions for the benefit of livestock use, wildlife habitat, watershed, and riparian areas; maintain, improve or restore riparian habitat to enhance forage conditions, wildlife habitat, and stream quality: and to achieve proper functioning condition or better on 75 percent of riparian areas (Green River RMP).

- To support the goals and objectives of other resource programs for managing the BLM administered public lands and to respond to public demand for land use authorizations.(Great Divide RMP).

- To manage the public lands to support the goals and objectives of other resource programs, to respond to public demand for land use authorizations, and to acquire administrative and public access where necessary (Green River RMP).

4.6.3 Direct and Indirect Impacts

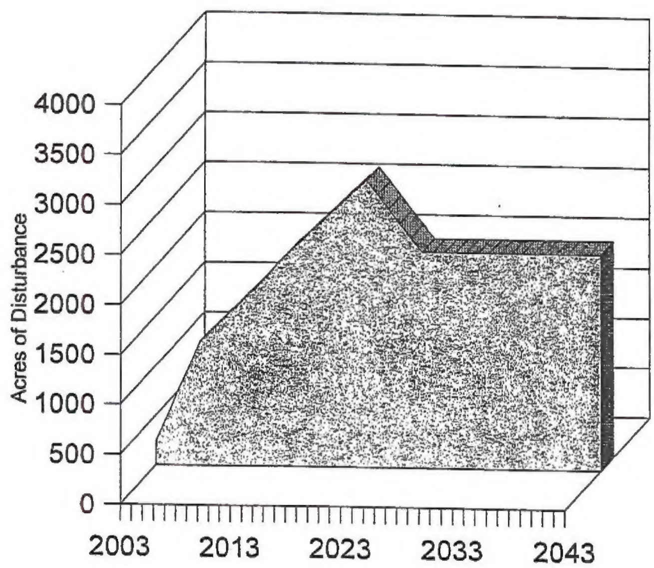
The DFPA includes land that is located within 13 BLM grazing allotments (described in Section 3.6). Under all alternatives, livestock grazing activities would continue in these allotments during all phases of gas development. Forage would be reduced during drilling and field development and restored as soon as practical thereafter (Section 2.5.2.10), except for areas used for roads, production equipment and ancillary facilities, which would remain disturbed throughout the productive life of the field.

4.6.3.1 Proposed Action

The Proposed Action would result in an estimated 4,923 total acres of short-term disturbance during drilling and field development, including a total of 2,624 acres disturbed for new or upgraded access roads and two-tracks, 758 acres disturbed for pipeline construction, 1,444 acres disturbed for drill pads and 97 acres disturbed for ancillary facilities. However, only a portion of this total would be disturbed at any one time during the 20-year drilling and field development cycle. Drill pads and roads associated with dry holes and unused portions of productive well pads would be reclaimed to the approximate land form that existed prior to construction. If drilling is productive, all access roads to the well site would remain in place for well servicing activities (i.e., maintenance, improvements, etc.). Partial reclamation would be completed on segments of the well pad and access road ROW no longer needed. All areas disturbed for gas and produced water pipelines would also be reclaimed.

Based on the assumption that reclaimed areas would be suitable for grazing five years after reclamation, total disturbance would begin at 247 acres in 2003, increase to a peak of 2,871 acres in 2022, then decrease to a constant 2,139 acres from 2027 through 2042, the remainder of the analysis period (Figure 4-6).

Figure 4-6. Total Disturbance: Proposed Action



Source: Blankenship Consulting LLC

Long term disturbance would include 1,706 acres of new roads, which would be used to access wells and ancillary facilities during operations, 336 acres of the DFPA disturbed for drill pads and 97 acres for ancillary facilities. All remaining disturbed areas would be reclaimed at the end of field operations, except those facilities which the BLM may identify as desirable for other use.

The average stocking rate for the RFO grazing allotments affected by the Proposed Action is 12 acres per AUM; the average for the Rock Springs Grazing allotment is about 9 acres per AUM. Consequently, the Proposed Action would result in an average annual loss of forage to support 158 AUM's in the RFO portion of the DFPA and 12 AUM's in the RSFO portion. These losses would total 6,796 AUM's for both areas over the 40 year LOP. Average annual losses of AUM's in the RFO portion of the DFPA would amount to substantially less than one percent of the total AUM's permitted on the 12 allotments. The portion of the RSFO-administered allotment (the Rock Springs allotment) that lies within the DFPA receives little or no use because of terrain and access considerations, so temporary loss of forage in that area would not be likely to impact grazing levels in that allotment. The estimated average annual loss of 12 AUM's would represent a negligible portion of the over 100,000 AUM's permitted for the Rock Springs Allotment. Estimated economic effects of these reductions are discussed in Section 4.12.3.1.2.

The Proposed Action-related increase in traffic in the DFPA, particularly during the drilling and field development phase, would correspondingly increase the potential for vehicle/livestock accidents during that period. The potential for vehicle/livestock accidents is particularly high in areas where calves and lambs are present, and on roads on ridge lines, flats and other open areas that attract trailing bands of sheep and wintering sheep. Given the low traffic volumes associated with field operations, vehicle/livestock collisions are of less concern for the long term.

There is also potential for damage to BLM and livestock operator fences, gates and cattle guards from the movement of trucks, drilling rigs and heavy equipment and for the scattering of livestock off allotments from gates being left open. Unless gates are promptly repaired to appropriate standards, livestock may scatter off the allotment. Scattering of livestock results in additional costs for grazing permittees for locating and moving livestock and potential damage to the range outside of authorized allotments. In areas bordering the Adobe Town Wild Horse Management Area, open gates can result in wild horses entering grazing allotments, resulting in additional round-up costs for the BLM and loss of forage and increased maintenance costs for livestock operators (Otto 2002).

Disturbance of soil and the movement of vehicles would increase the potential for introduction and spreading of invasive, non-native species into the relatively weed-free portions of the DFPA. Potential invasive, non-native species impacts are discussed in Section 4.5.3.1.

As described in Section 3.6, other land use on and adjacent to the proposed action includes wildlife habitat, dispersed outdoor recreation and oil and gas exploration, development, and transportation. Effects on wildlife resources are described in Section 4.7. Effects on recreation resources are described in Section 4.9. Although there is some potential for drilling and field development activities to encroach on existing oil and gas leases, ROW's, and facilities, the preconstruction planning and site layout process described in Section 2.5.1 would minimize this potential.

Based on the assumptions and estimates contained in this assessment, and with the mitigation measures outlined in Sections 2.5.2.11.2 and 4.6.5, Proposed Action-related drilling and field development activities would not result in significant impacts to range resources or other land use.

4.6.3.2 Alternative A

Implementation of Alternative A would increase disturbances by about 55 percent over those associated with the Proposed Action, on an average annual basis. Loss of forage associated with Alternative A would result in an average loss of 248 AUM's annually from the RFO portion of the DFPA and 18 AUM's from the RSFO portion. These losses would represent substantially less than one percent in either portion.

Opportunities for vehicle/livestock collisions and the damaging of livestock control structures would be substantially increased under this alternative based on the increase in traffic and activity in the DFPA. Opportunities for introduction of invasive, non-native species and the potential for encroachment on other leases and ROW's would also be increased.

Successful implementation of the mitigation measures outlined in Sections 2.5.2.11.2 and 4.6.5 would prevent significant impacts to range resources or other land use under Alternative A.

4.6.3.3 Alternative B - No Action

Under Alternative B, development in the DFPA would include the previously approved decisions for the Mulligan Draw and the Dripping Rock/Cedar Breaks areas as well as other development approved on a case-by-case basis by the BLM. Range resources impacts would be similar to those described above. In terms of magnitude, such impacts would likely be significantly less than for the Proposed Action.

The potential for vehicle/livestock collisions and damage to livestock control structures would depend on the number of wells ultimately approved under the No Action Alternative, as would the potential for the introduction of invasive, non-native species and encroachments on other leases and ROW's. In any case, these impacts are not anticipated to be significant.

4.6.4 Impacts Summary

Range and other land use impacts associated with all three alternatives would include disturbed land and associated loss of AUM's, which would average about 170 AUM's annually for the Proposed Action, 248 annually for Alternative A and an unknown amount for Alternative B (No Action) depending on the number of wells ultimately approved by the BLM (Mulligan Draw and Dripping Rock/Cedar Breaks areas, plus wells in other portions of the DFPA approved on a case-by-case basis).

The potential for vehicle livestock collisions, damage to livestock control structures, introduction of invasive, non-native species and encroachments on other leases and ROW's is greater under Alternative A than under the Proposed Action, given the 54 percent increase in wells and associated traffic and activity. The potential for these impacts would be considerably less under Alternative B, unless the ultimate number of wells approved approached that of the Proposed Action.

4.6.5 Additional Mitigation Measures

With implementation of mitigation measures proposed in Section 2.5.2.11.2, no additional mitigation measures are required.

4.6.6 Residual Impacts

Given the application of the mitigation measures outlined in Section 2.5.2.11.2 and considering that no additional mitigation measures are proposed, no residual impact discussion is required. Impacts would remain the same as described in Section 4.6.3.

4.7 WILDLIFE

4.7.1 Introduction

The principal wildlife impacts likely to be associated with the Proposed Action or alternatives include: (1) a direct loss of certain wildlife habitat, (2) the displacement of some wildlife species, (3) an increase in the potential for collisions between wildlife and motor vehicles, and (4) an increase in the potential for the illegal kill and harassment of wildlife.

4.7.1.1 Analysis Approach

A total of 361 well locations are proposed under the Proposed Action for the 233,542-acre project area. Long-term disturbance, as a result of the Proposed Action, totals 2,139 acres and would result in disturbance of 0.9% of the DFPA. Well locations are not known at this time, and would likely be concentrated within and near existing gas fields. Therefore, an analysis of potential wildlife impacts within each section in the DFPA was made so that operators could take the locations of these potential impacts into account when planning and selecting eventual well locations.

A maximum of 4 well locations would be devèloped within any given section except those where such development would produce unacceptable levels of wildlife impacts. Mitigation measures that correspond to the respective types of wildlife impacts within any given section would be implemented.

Based on existing data sources, the primary wildlife resource concerns known to be present within each section of the DFPA were mapped (HWA 2002). These resource concerns include: big game (elk, mule deer, pronghorn) crucial winter ranges; overlapping big game crucial winter ranges (multiple species); leks, nesting habitat, and severe winter relief habitat of greater sage-grouse; raptor nests; potential mountain plover habitat; and white-tailed prairie dog colonies. This approach facilitated the construction of a map showing the combinations of wildlife resources within each section that may require mitigation, and areas where those resource concerns overlap (Figure 4-7; Appendix G).

The wildlife map represents the currently known locations of wildlife resource concerns within the DFPA. As more field data is gathered, additional areas that include wildlife resource concerns may be identified and mapped. Every combination of wildlife resource concerns within each section of the DFPA is described and listed in Appendix G. If development occurs in areas of overlapping wildlife resource concerns, mitigation measures for each individual resource would be implemented. Mitigation measures for wildlife species are summarized in Sections 2.5.2.11.2, 4.7.6, 4.8.1.4, and 4.8.2.3. This approach provides the operators with beneficial information that can be utilized when developing gas well placement plans. Planned placement of disturbances may be used to avoid individual wildlife resource concerns, or overlapping concerns present within a

section. All appropriate mitigation measures for the corresponding wildlife resources that are disturbed within a section would be implemented.

The potential impacts upon individual species and the primary resources that overlap those species are discussed in the Direct and Indirect Impacts Sections. Summaries of combinations of wildlife concerns, and overlapping wildlife resources are presented in Sections 4.7.3.1.6, 4.8.1.2.1, and 4.8.1.2.2. Detailed analyses of overlapping wildlife resources are presented in the Wildlife and Fisheries Technical Report for this project (HWA 2002).

4.7.2 Impact Significance Criteria

The following criteria were considered in the assessment of impacts associated with the Proposed Action and alternatives:

- Whether or not the action would result in non-compliance with existing BLM (USDI-BLM 1988a, 1990a, USDI-BLM 1996a, 1997), FWS, or WGFD management objectives for wildlife, or BLM wildlife stipulations for surface occupancy criteria on natural gas mineral developments.
- Whether or not a substantial increase in direct mortality of wildlife due to road kills, harassment, or other causes would occur.
- Whether or not an officially-designated crucial wildlife habitat was eliminated, sustained a permanent reduction in size, or was otherwise rendered unsuitable.
- Whether or not any effect, direct or indirect, results in a long-term decline in recruitment and/or survival of a wildlife population.
- Disruption of greater sage-grouse, or raptor breeding or nesting activities to the extent that reproductive success is threatened or damaged.

4.7.3 Direct and Indirect Impacts

Wildlife habitats directly affected by the proposed project include areas which are physically disturbed by the construction of wells, roads, pipelines, and production facilities; wildlife habitats indirectly impacted include areas surrounding directly impacted habitats. Disturbance during construction and production such as human presence and noise may displace or preclude wildlife use of these areas. Wildlife sensitivity to these potential indirect impacts varies considerably with each animal species. Potential direct and indirect impacts to wildlife species are discussed in the following sections. The Wildlife Monitoring/Protection Plan (Appendix H) would be used to detect any potential unanticipated impacts to wildlife and fish species throughout the LOP.

4.7.3.1 Proposed Action

As described in detail in Section 2.2, a total of 385 new natural gas wells at 361 well locations would be drilled and developed under this alternative during the next 20 years with an expected LOP of 30-50 years. Well placement within the DFPA is not known at this time, therefore it was assumed that any section may potentially be developed.

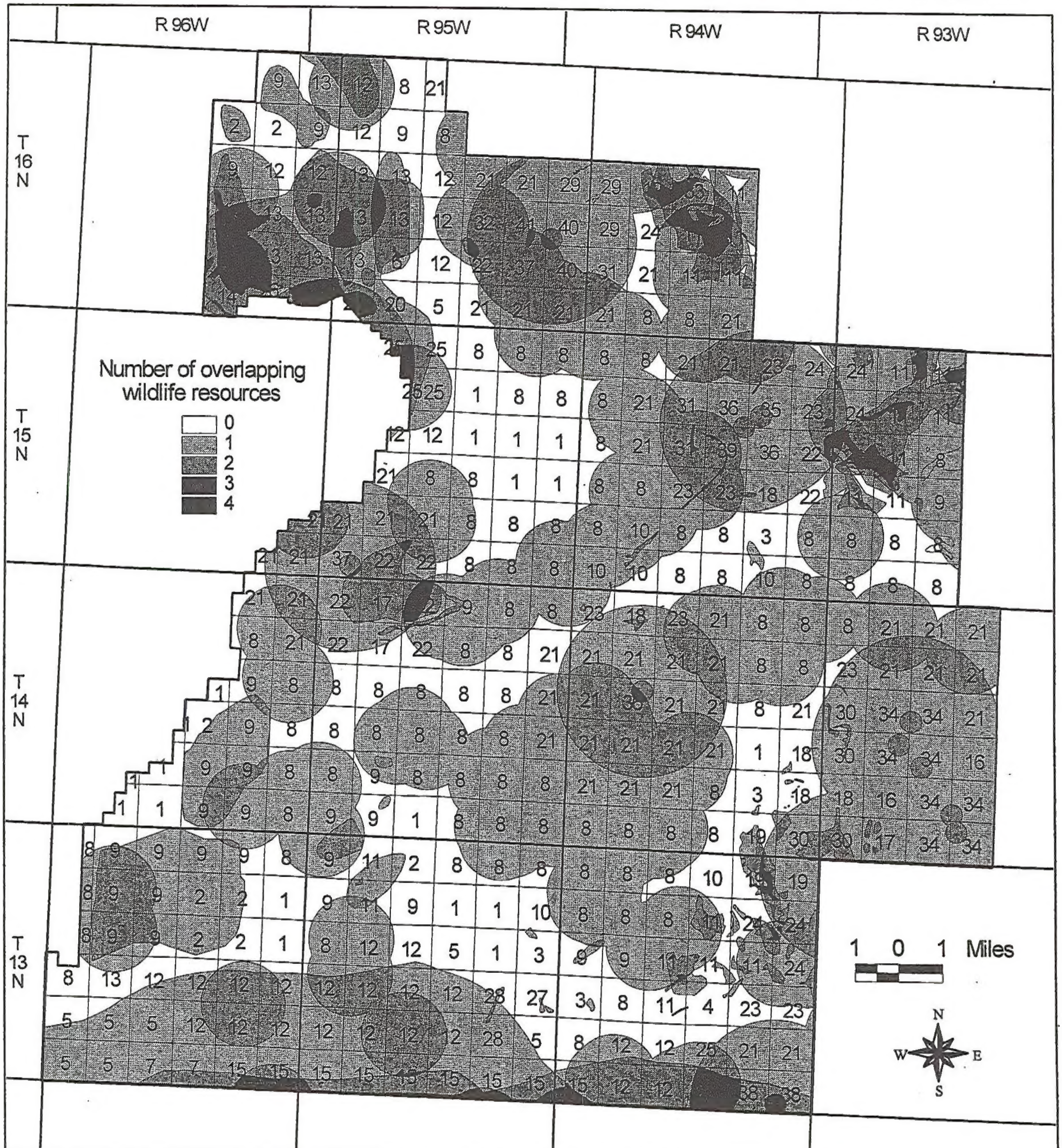


Figure 4-7. Locations and types of wildlife resources that could potentially be impacted within each section of the DFPA. Numbers in sections are resource codes listed in Appendix G and describe the combinations of wildlife resources present. The physical distribution and overlap of wildlife resources is depicted by levels of shading. Wildlife resource include: big game (elk, mule deer, pronghorn) crucial winter range; greater sage grouse leks (1/4 mi. buffer), nesting habitat (2-mile buffer around leks), and severe winter relief habitat; potential mountain plover habitat; raptor nest 1-mile buffers; and prairie dog colonies.

Development at this level would disturb approximately 4,923 acres of wildlife habitat over the next twenty-years. However, reclamation of disturbed habitats would commence immediately and continue throughout the 20-year construction period, resulting in a total un-reclaimed disturbance area at any given point in time that would never equal the sequential total of 4,923 acres. Reclamation of disturbed areas along pipelines, road ROW's, and unused portions of well pads would result in re-establishment of vegetation in these areas, in a relatively short time period. Re-vegetation would continue with the subsequent reclamation of abandoned well sites. This reclamation would reduce the area disturbed by the Proposed Action by 56.6 percent, to 2,139 acres (this assumes a 65% drilling success rate with roads to unsuccessful wells being reclaimed). Grasses and forbs are expected to become established within the first several years following reclamation, however an estimated 8 to 15 years would be required for shrub re-establishment. Consequently, the removal of shrub habitat within the project area would represent a longer-term loss to those species that depend on such vegetation for forage or shelter.

In addition to the direct loss of habitat due to construction of well pads and associated roads and pipelines, disturbances from human activity and traffic may lower the utilization of habitat immediately adjacent to these areas. Habitat effectiveness of these areas would be lowest during the construction phase when human activities are more chronic and localized. During the production phase of operations, many animals would likely become accustomed to equipment and facilities and once again resume using habitats immediately adjacent to these areas.

4.7.3.1.1 General Wildlife

The disturbance of 4,923 acres of wildlife habitat would reduce habitat availability for a variety of common small birds and mammals. The temporary disturbances that occur during the 20-year construction period would tend to favor early succession wildlife species such as ground squirrels and horned larks and would have more impact on mid-to-late-succession species such as sage sparrows, sage thrashers, and voles. The long-term disturbance of 2,139 acres would have a low effect on common wildlife species. The primary non-game songbirds that may be affected by the reduction in habitat would be horned larks, sage sparrows, sage thrashers, and vesper sparrows. Although there is no way to accurately quantify these changes, the impact is likely to be low in the short term and be reduced over time as reclaimed areas begin to provide suitable habitats. Because of the high reproductive potential of these species they would rapidly repopulate reclaimed areas as habitats become suitable. Birds are highly mobile and would disperse into surrounding areas and utilize suitable habitats to the extent that they are available.

The primary small mammals found on the project area include, but are not limited to, desert cottontail, deer mice, least chipmunks, mountain cottontail, and golden-mantled ground squirrels. The initial phases of surface disturbance would result in some direct mortality and displacement of small mammals from construction sites. Quantifying these changes is not possible because population data are lacking. However, the impact is likely to be low, and the high reproductive potential of these small mammals would enable populations to quickly repopulate the area once reclamation efforts are initiated.

4.7.3.1.2 Big Game

Impacts to big game species include the removal of habitat; displacement due to increased human activities; increased potential for vehicular collisions due to new roads and increased traffic levels on existing roads; and increased potential for poaching due to easier access and increased human

activities. The disturbance to big game species depends on the seasonal use of the area by each species and the corresponding drilling schedule. Also, displacement due to human disturbance would be more pronounced in the short term, and the magnitude depends on the ability of a species to habituate to disturbance. Potential impact summaries and disturbance responses for each big game species are presented below.

Pronghorn Antelope

The 13,612 acres of pronghorn crucial winter/yearlong range are located within 46 sections of the DFPA (Figure 3-10; Appendix G). These sections are located in the northwest corner and southern edge of the DFPA. Portions of 14 of these sections are located within the MVMA. The remainder of the DFPA (219,930 acres) is classified as winter/yearlong range. Pronghorn crucial winter/yearlong range was overlapped most often with raptor nest buffer areas (4,492 acres), followed by potential mountain plover habitat (2,400 acres) (HWA 2002). Significant impacts in these areas of overlapping resources are not expected if the mitigation measures for each of these individual resources are implemented.

Development of the maximum 4 well locations within a section composed entirely of pronghorn crucial winter range would remove approximately 54.5 acres, or 8.5%, of the habitat in that section. The WGFD classifies big game crucial winter habitats as vital and recommends that habitat function be maintained so that the location, essential features, and species supported by the habitat are unchanged (WGFD 2000b). Not all habitat within designated crucial winter range is of equal quality. Areas with higher quantity and quality of forage and areas that provide cover from extreme winter weather conditions provide the best quality crucial winter range habitat. Avoidance of these areas, as identified by the BLM, on a case-by-case basis, would reduce impacts to pronghorn crucial winter range habitat. Reclamation of well pads, pipelines, and ROW's would provide grass forage within a few years, while sagebrush and other shrub species important as winter forage would require longer for re-establishment (approximately 8 to 15 years). Disturbance of seasonal pronghorn ranges within the DFPA is not likely to reduce pronghorn carrying capacity within the Bitter Creek Herd Unit. Several general pronghorn migration routes transverse the DFPA, but these routes are not expected to be impacted because no linear barriers such as fences would be constructed.

In addition to the direct removal of habitat due to the development of wells and associated transportation facilities, disturbances from drilling activities and traffic would affect utilization of the habitat immediately adjacent to these areas. However, pronghorn have been found to habituate to increased traffic volumes and heavy machinery as long as the machines move in a predictable manner (Reeve 1984). Pronghorn have also been found to habituate to and inhabit surface mining sites in Wyoming (Segerstrom 1982, Deblinger 1988). Well development operations and deviation from ordinary activities may cause limited antelope displacement of up to 0.5 miles (Segerstrom 1982), but they would likely habituate to activities along roads and continue using habitats in those areas (Reeve 1984). The magnitude of displacement would decrease over time as: (1) the animals have more time to adjust to the circumstance, and (2) the extent of the most intensive activities such as drilling and road building diminishes and more wells are put into production. By the time the field is under full production, construction activities will have ceased, and traffic and human activities in general would be greatly reduced. As a result, this impact would be minimal and it is unlikely that pronghorn would be significantly displaced under full field development. The level of pronghorn use of the area is more likely to be determined by the quantity and quality of forage available. Restricting construction activities and vehicle traffic within pronghorn crucial

winter/yearlong range from November 15 to April 30, in accordance with BLM stipulations, would minimize the probability of adverse impacts from displacement during this critical time of the year, and long-term adverse effects are not expected.

The potential for vehicle collisions with pronghorn would increase as a result of increased vehicular traffic associated with the presence of construction crews and would continue (although at a reduced rate) throughout all phases of the well operations. Requiring regular drivers to undergo training and education is expected to reduce the incidence of vehicle collision impacts to pronghorn to low levels and no long-term adverse effects are expected. Development of new roads would allow greater access to more areas and may lead to an increased potential for poaching of big game animals. The application of mitigation described in Section 2.5.2.11.2 and 4.7.6 would minimize impacts, and long-term adverse effects to pronghorn are not expected.

Mule Deer

The 19,430 acres of mule deer crucial winter/yearlong range are located within 42 sections of the DFPA (Figure 3-11; Appendix G). Mule deer crucial winter/yearlong range is located in the extreme northern and southwestern portions of the DFPA. Three of these sections are located within the MVMA. The remainder of the DFPA (214,112 acres) is classified as winter/yearlong range. Mule deer crucial winter/yearlong range was overlapped most often by raptor nest buffer areas (5,867 acres), followed by elk crucial winter/yearlong range (1,458 acres) (HWA 2002). Significant impacts in these areas of overlapping resources are not expected if the mitigation measures for each of these individual resources are implemented.

Development of the maximum 4 well locations within a section composed entirely of mule deer crucial winter range would remove approximately 54.5 acres, or 8.5%, of the habitat in that section. The WGFD classifies big game crucial winter habitats as vital and recommends that habitat function be maintained so that the location, essential features, and species supported by the habitat are unchanged (WGFD 2000b). Not all habitat within designated crucial winter range is of equal quality. Areas with higher quantity and quality of forage and areas that provide cover from extreme winter weather conditions provide higher quality crucial winter range habitat. Avoidance of these areas, as identified by the BLM, on a case-by-case basis, would reduce impacts to mule deer crucial winter range habitat. Reclamation of the well pads and ROW's would provide grass forage within a few years, while mountain mahogany, big sagebrush, and other shrub species important as forage for mule deer would require a longer time period for re-establishment (approximately 8 to 15 years). Disturbance of seasonal mule deer ranges within the DFPA is not likely to reduce mule deer carrying capacity within the Baggs Herd Unit. Several general mule deer migration routes transverse the DFPA, but these routes are not expected to be impacted because no linear barriers such as fences would be constructed.

In addition to the direct removal of habitat due to the development of wells and associated transportation facilities, disturbances from drilling activities and traffic would affect utilization of the habitat immediately adjacent to these areas. Mule deer, however, are adaptable and may adjust to non-threatening, predictable human activity (Irby et al. 1988, Gusey 1986). During a three-year study of response of pronghorn and mule deer to petroleum development on crucial winter range in central Wyoming, Easterly et al. (1991) found that mule deer "did not avoid oil fields" and that "deer did not move significant distances from the well site after the start of drilling activity." Similarly, in an assessment of the effects of winter 3D seismic operations on mule deer in western Wyoming, Hayden-Wing Associates (1994) found that although deer avoided areas of major

seismic activities, they quickly moved back onto such areas following completion of work. Furthermore, the deer were not displaced long distances and remained immediately adjacent to active seismic operations. Although seismic activities were seen to displace mule deer, there was no evidence that such displacement caused undo stress or negative effects. Most deer responses consisted of avoidance of areas proximal to the operations and deer carried out normal activities of feeding and bedding within 1/8 to ½ mile of most active seismic operations (Hayden-Wing Associates 1994).

The magnitude of displacement would decrease over time as: (1) the animals have more time to adjust to the circumstance, and (2) the extent of the most intensive activities such as drilling and road building diminishes and more wells are put into production. By the time the field is under full production, construction activities will have ceased, and traffic and human activities in general would be greatly reduced. As a result, this impact would be minimal and it is unlikely that mule deer would be significantly displaced under full field development. The level of mule deer use of the area is more likely to be determined by the quantity and quality of forage available. Restricting construction activities and vehicle traffic (through road closures) within mule deer crucial winter/yearlong range from November 15 to April 30, in accordance with BLM stipulations, would minimize the probability of adverse impacts from displacement during this critical time of the year, and long-term adverse effects are not expected.

The potential for vehicle collisions with mule deer would increase as a result of increased vehicular traffic associated with the presence of construction crews and would continue (although at a reduced rate) throughout all phases of the well operations. Requiring regular drivers to undergo training and education is expected to reduce the incidence of vehicle collision impacts to mule deer to low levels and no long-term adverse effects are expected. Development of new roads would allow greater access to more areas and may lead to an increased potential for poaching of big game animals. The application of mitigation described in Sections 2.5.2.11.2 and 4.7.6 would minimize impacts, and long-term adverse effects to mule deer are not expected.

White-tailed Deer

Because of the very limited habitats suitable for white-tailed deer on the project area, use by this species is unlikely to occur very often, if at all, and impacts to white-tailed deer are not expected.

Elk

The 1,873 acres of elk crucial winter/yearlong range are located within 10 sections in the extreme southern portion of the DFPA (Figure 3-12; Appendix G). None of these sections are located within the MVMA. The remainder of the designated elk seasonal ranges within the DFPA consist of winter/yearlong (21,302 acres) and yearlong (9,364 acres) ranges. Approximately 201,003 acres or 86.1% of the project area is not designated as an elk seasonal range. Elk crucial winter/yearlong range was overlapped most often with mule deer crucial winter/yearlong range (1,458 acres), followed by raptor nest buffer areas and mule deer crucial winter/yearlong range (361 acres) (HWA 2002). Significant impacts in these areas of overlapping resources are not expected if the mitigation measures for each of these individual resources are implemented.

Development of 4 well locations within a section entirely composed of elk crucial winter range would remove approximately 54.5 acres, or 8.5%, of the habitat in that section. The WGFD classifies big game crucial winter habitats as vital and recommends that habitat function be maintained so that

the location, essential features, and species supported by the habitat are unchanged (WGFD 2000b). Not all habitat within designated crucial winter range is of equal quality. Avoidance of those areas that provide the best quality crucial winter range habitat, as identified by the BLM, on a case-by-case basis, would reduce impacts to elk crucial winter range habitat. Reclamation of the well pads and ROW's would provide grass forage within a few years, while mountain mahogany, big sagebrush, and other shrub species would require longer for re-establishment (approximately 8 to 15 years). Disturbance of seasonal elk ranges within the DFPA is not likely to reduce elk carrying capacity within the Petition Herd Unit. No elk migration routes have been determined to transverse the DFPA, however, elk from the Powder Rim, on the southern edge of the DFPA, do migrate east to the Sierra Madre and Elk Head mountains in the summer (Porter 1999). Potential elk migration routes are not expected to be impacted because no linear barriers such as fences would be constructed.

In addition to the direct removal of habitat due to the development of wells and associated transportation facilities, disturbances from drilling activities and traffic would affect utilization of the habitat immediately adjacent to these areas. Elk are more sensitive to human activities than pronghorn or mule deer, and they may be displaced from well construction areas by 0.75 - 2 miles (Brekke 1988, Gusey 1986, Hiatt and Baker 1981). Displacement would be reduced in areas with topographic barriers (Edge and Marcum 1991). Elk would likely habituate to the physical presence of gas wells and predictable, non-threatening traffic movement associated with well maintenance (Ward et al. 1973, Ward 1976, Hiatt and Baker 1981, Perry and Overly 1976). Only localized, short-term displacement of elk during the development phase of the project is expected to occur in those areas that are designated as elk seasonal ranges.

The magnitude of displacement would decrease over time as: (1) the animals have more time to adjust to the circumstance, and (2) the extent of the most intensive activities such as drilling and road building diminishes and more wells are put into production. By the time the field is under full production, construction activities will have ceased, and traffic and human activities in general would be greatly reduced. As a result, this impact would be minimal and it is unlikely that elk would be significantly displaced under full field development. The level of elk use of the area is more likely to be determined by the quantity and quality of forage available. Restricting construction activities and vehicle traffic (through road closures) within elk crucial winter/yearlong range from November 15 to April 30, in accordance with BLM stipulations, would minimize the probability of adverse impacts from displacement during this critical time of the year, and long-term adverse effects are not expected.

The potential for vehicle collisions with elk would increase as a result of increased vehicular traffic associated with the presence of construction crews and would continue (although at a reduced rate) throughout all phases of the well operations. Requiring regular drivers to undergo training and education is expected to reduce the incidence of vehicle collision impacts to elk to low levels and no long-term adverse effects are expected. Development of new roads would allow greater access to more areas and may lead to an increased potential for poaching of big game animals. The application of mitigation described in Sections 2.5.2.11.2 and 4.7.6 would minimize impacts, and long-term adverse effects to elk are not expected.

Overlapping Big Game Crucial Winter Range

Areas of overlapping big game crucial winter range are of greater importance because they provide crucial habitat for more than one species of big game. There are several small areas of overlapping big game crucial winter range located in 11 sections on the Powder Rim along the southern edge of the DFPA (Figure 4-7). The combinations of overlapping big game crucial winter ranges include the following: elk/mule deer 1,931 acres; mule deer/antelope 733 acres; elk/antelope 111 acres; elk/mule deer/antelope 111 acres (HWA 2002). The impacts of habitat loss within overlapping crucial winter ranges would be greater than in non-overlapping areas. The Great Divide RMP (USDI-BLM 1990a) states that habitat quality will be maintained within areas of overlapping big game crucial winter ranges. Therefore, in areas where overlapping crucial winter ranges would be disturbed, steps to reduce disturbance, such as a reduction in the number of well locations allowed per section to less than 4, would reduce impacts. This may require directional drilling of wells to limit disturbance. If overlapping big game crucial winter range habitat is disturbed, further measures such as vegetation enhancement in adjacent areas may be implemented, if deemed appropriate by the BLM, in order to compensate for loss of forage in the area.

4.7.3.1.3 Wild Horses

The majority of the DFPA lies within the bounds of the Adobe Town Wild Horse HMA. Within the project area, 194,105 acres (83.1 percent) are classified as part of the Wild Horse HMA and an additional 37,976 acres (16.3 percent) not within the Wild Horse HMA are used by wild horses during some portion of the year (USDI-BLM 1999d). In the following discussion this area is referred to as "other wild horse habitat". Surface disturbances associated with the initial installation of gas wells, roads, pipelines, and ancillary facilities would impact some of these habitats. The majority of sections (334 out of 377, or 89%) within the DFPA and all sections within the MVMA are included within the Adobe Town Wild Horse HMA (Figure 3-13).

Development of 4 well locations per section would result in loss of forage, and exploration and development activities within the DFPA may cause temporary displacement of horse bands from range adjacent to developing well sites, to other range in the Adobe Town Wild Horse HMA. The disturbance and displacement would be a short-term, local impact on individual horses that use areas where well pads are being developed. Increased human activity over the long-term may potentially influence the "wild" behavior of horses as they become more acclimated to human presence and activity. At this time it is not known what impacts the long-term activity within a natural gas field may have upon the behavioral patterns of wild horses. The short-term displacement of some horses utilizing areas near wells pads or roads may result in increased pressure on sensitive resource areas such as springs and water holes. However, development may create areas such as water impoundments and vegetation on reclamation areas that horses are attracted to. In these instances, horse use of naturally occurring sensitive areas such as springs may be reduced. Post-reclamation disturbance would be reduced to approximately 2,139 acres within the DFPA. On-going project activities on these 2,139 acres would remain throughout the 30 to 50-year life of production for the gas field. Implementation of the Proposed Action is not expected to significantly impact wild horses within the DFPA.

4.7.3.1.4 Upland Game Birds

Greater Sage-grouse. Six leks that were active during 2000 surveys are located on and within 2 miles of the DFPA (Figure 4-8). According to BLM and WGFD historical records, ten additional leks have been documented that were not active during the surveys of 2000 (Figure 4-8). For the purpose of this analysis, all leks on and within two miles of the DFPA are considered active until such time as a determination can be made through field monitoring, that the leks are historic. Historic leks are those that have not been used in the past 7-10 years. Eleven greater sage-grouse leks are located within the DFPA. The 0.25 mile buffers around those leks total1,362 acres and collectively occupy portions of 20 sections. Five leks are located within the 2-mile buffer of the DFPA. No leks are located within the MVMA portion of the DFPA.

Breeding. Noise related to drilling and production activities may affect greater sage-grouse utilization of leks or reproductive success. Reduction of noise levels in areas near leks would minimize this potential impact. Surface disturbance would be avoided within 0.25 miles of leks unless they are considered historic. However, the BLM in consultation with the WGFD, may grant linear disturbance (e.g. pipelines, seismic activity) exceptions that do not result in permanent habitat loss. The APD process allows BLM and WGFD personnel the opportunity to review status of leks relative to project activities and determine necessary courses of action to ensure that greater sage-grouse leks are not significantly impacted. By definition, all lek buffer areas are overlapped by greater sage-grouse nesting habitat. Lek buffer areas were also overlapped by pronghorn crucial winter/yearlong range (112 acres) and raptor nest buffer areas (104 acres) (HWA 2002). Because disturbance within the 0.25-mile lek buffer areas would be avoided, no impacts in these overlap areas are expected.

Nesting. Development of 4 well locations within a section located entirely within 2 miles of a greater sage-grouse lek would remove approximately 54.5 acres, or 8.5%, of the habitat in that section. To protect greater sage-grouse nesting habitats, the BLM would not allow construction activities within a 2-mile radius of greater sage-grouse leks between March 1 and June 30. A total of 133 sections (55,689 acres) within the DFPA contain portions of the 2-mile buffers surrounding greater sage-grouse leks (Figure 4-7). Two sections of the project area located within the MVMA contain portions of the 2-mile buffer surrounding one lek. Not all habitat within 2 miles of leks would provide quality nesting habitat for greater sage-grouse. Areas with mature stands of sage brush would provide the best quality nesting habitat. Avoidance of these areas, as identified by the BLM, on a case-by-case basis, would reduce impacts to greater sage-grouse nesting habitat. Greater sage-grouse nesting buffer areas are overlapped most often by raptor nest buffer areas (17,363 acres), followed by mountain plover habitat (1,886 acres) (HWA 2002). Significant impacts in these areas of overlapping resources are not expected if the mitigation measures for each of these individual resources are implemented.

Wintering Areas. The areas classified as severe winter relief habitats (Figure 3-10) total approximately 209 acres and are located within 19 different sections of the DFPA (HWA 2002). None of these sections are located within the MVMA. This habitat would be crucial for greater sage-grouse survival during severe winters, therefore, surface disturbance would be avoided within these 209 acres. These wintering areas are overlapped most often by greater sage-grouse nesting areas (69 acres), followed by overlap by both raptor nest buffer areas and greater sage-grouse nesting areas (60 acres) (HWA 2002). Because disturbance within these wintering areas would be avoided, no impacts in these overlap areas are expected.

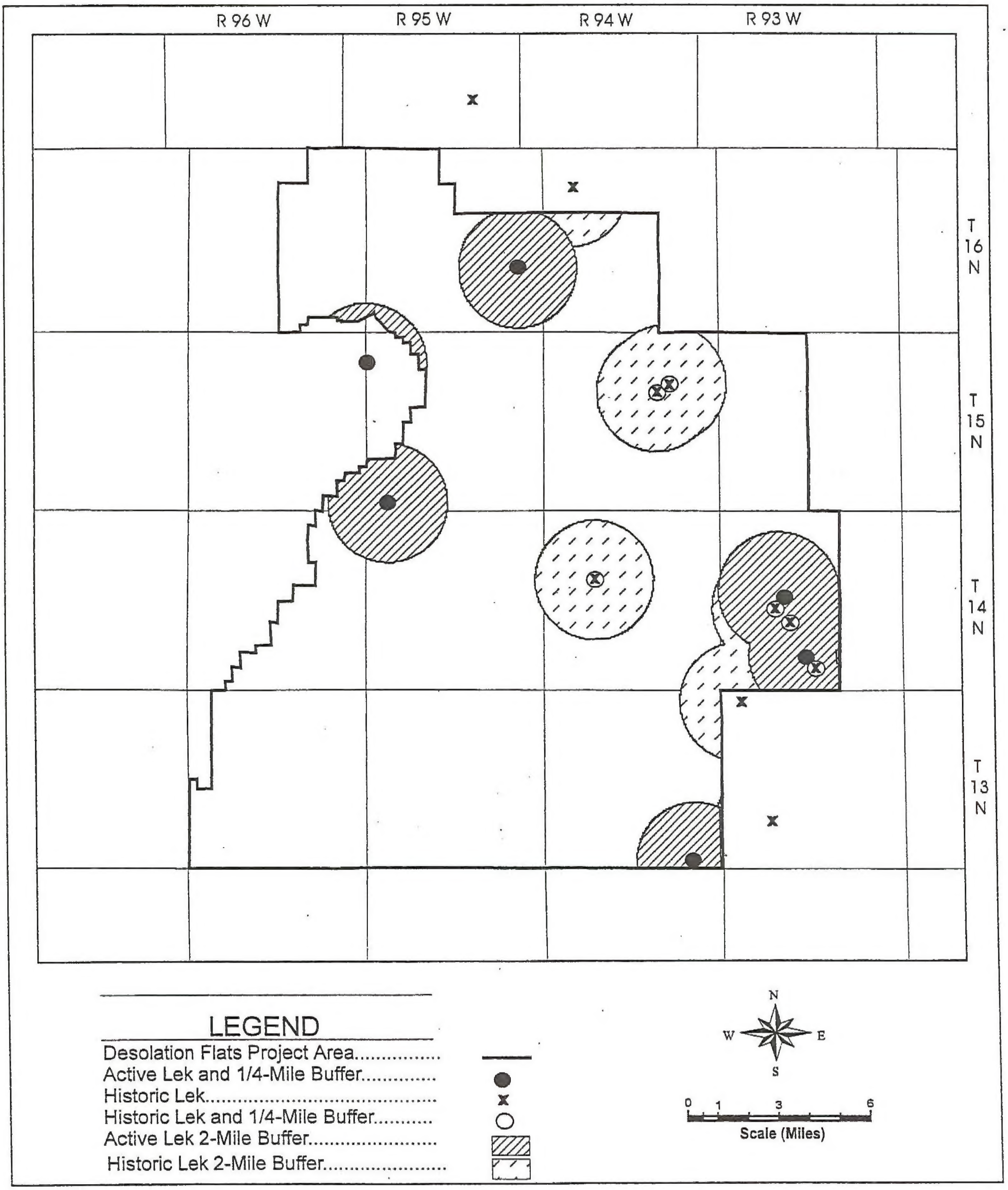


Figure 4-8. Greater Sage Grouse Lek Locations and Buffer Zones within the Desolation Flats Project Area.

If, during the course of the gas field development, additional leks or severe winter relief habitat areas are identified, the aforementioned mitigation measures would apply. Greater sage-grouse using leks and hens nesting adjacent to roads may experience some disturbance and potential mortality from vehicle collisions as development of the gas field progresses. This potential mortality is not likely to significantly affect the greater sage-grouse population within the project area. Through seasonal closures, reclamation, avoidance, and mitigation measures, significant impacts to the greater sage-grouse population would not be expected to occur as a result of implementation of the Proposed Action.

Mourning Dove. Both migratory and nesting populations of mourning doves have been recorded within the region and it is likely that they occur on the project area (WGFD 2000c). Mourning doves would be expected to concentrate along the riparian habitats within the project area. These habitats are very limited within the DFPA, and impacts to mourning doves as a result of implementation of the Proposed Action are not expected.

4.7.3.1.5 Raptors

The potential impacts that the Proposed Action could have on raptors within the DFPA include: (1) nest desertions and/or reproductive failure due to project activities or increased public access, (2) temporary reductions in prey populations, and (3) mortality associated with roads. Based on aerial and ground inventories conducted in the spring and summer of 2000, and historic BLM records, 204 raptor nests were identified within a one-mile buffer of the DFPA (HWA 2002). Nests which were tended or active during 2000 include: two ferruginous hawk, three red-tailed hawk, and four golden eagle nests. Although several other species of raptors were observed, or are known to occur on the project area, the status of nesting is unknown (see Section 3.7.7). One-mile buffers were placed around all of the raptor nest sites and the majority of sections within the DFPA (296 of 377; 78.5%) included at least some portion of a raptor nest buffer. In the MVMA portion of the project area, 21 out of 24 sections included at least some portion of a raptor nest buffer. Raptor nest buffer areas are overlapped most often by greater sage-grouse nesting area buffers (17,363 acres), followed by mountain plover habitat (6,658 acres) (HWA 2002). Significant impacts in these areas of overlapping resources are not expected if the mitigation measures for each of these individual resources are implemented.

The primary potential impact to raptors from project activities is disturbance during nesting that might result in reproductive failure. To minimize this potential, disturbance would not be allowed during the critical nesting season (Feb. 1 - July 31, depending on species) within 1 mile of an active nest of listed or sensitive raptor species, and 3/4 - ½ mile (depending upon species or line of sight) of an active nest of other raptor species. The nature of the restrictions, exclusion dates, and the protection radius would vary, depending upon activity status of nests, species involved, natural topographic barriers, and line-of-sight distances, and would be determined by the BLM. Nests not used in one year, may potentially be used in subsequent years. Development within close proximity to these nests may preclude use of the nest in following years. Therefore, protection of nests that may potentially be used in future years, such as limiting construction of permanent above-ground structures within 300m (depending upon species and/or line of sight), would minimize impacts. If "take" of an inactive nest is unavoidable, development of artificial nesting structures would mitigate for the loss of the nest. In some instances, during the production phase when human activity is reduced, raptors may actually nest on structures associated with gas production. Given the application of these mitigation measures, significant impacts to raptor nesting activities are not expected.

The development of proposed well pads and associated roads and pipelines would initially disturb an estimated 4,923 acres of potential habitat for several species of small mammals that serve as prey items for raptors. This short-term impact would affect approximately 2.1 percent of the project area and is not likely to be the determining factor of raptor use within the project area. The small amount of short-term change in prey base populations created by the construction associated with the proposed action is minimal in comparison to the overall status of the rodent and lagomorph populations. While prey populations on the project area would likely sustain some impact during the initial phase of the project, prey numbers would be expected to soon rebound to pre-disturbance levels following reclamation of approximately 56 percent of the total initial disturbance area involving pipelines, unused portions of well pads and roads, and wells that are no longer productive. Once reclaimed, these areas would likely promote an increased density and biomass of small mammals that is comparable to those of undisturbed areas (Hingtgen and Clark 1984). For these reasons, implementation of the Proposed Action is not expected to produce any appreciable long-term negative changes to the raptor prey base within the project area.

The creation of new roads would increase public access to areas within the project area. As use of the project area by both workers and recreationists increases, the potential for encounters between raptors and humans would increase and could result in increased disturbance to nests and foraging areas. Closure of roads located near active raptor nests to public vehicle use would offset this potential impact.

Some raptor species feed on road-killed carrion on and along the roads, while others (owls) may attempt to capture small rodents and insects that are illuminated in headlights. These raptor behaviors put them in the path of oncoming vehicles where they are in danger of being struck and killed. The potential for such collisions can be reduced by requiring that regular drivers undergo training that describes the circumstances under which vehicular collisions are likely to occur and the measure that can be taken to minimize them. The application of mitigation measures described in Section 2.5.2.11.2 and 4.7.6 would minimize impacts, and significant impacts to raptors utilizing the DFPA are not expected.

4.7.3.1.6 Combinations of Wildlife Concerns

The maximum number of potential wildlife concerns located within a single section is 5 (resource codes #33 and #41 in Appendix G) and this occurred in only two sections (T16N:R95W Section 23; T16N:R94W Section 16). A single known wildlife resource of concern is present in 117 sections; two are present in 146 sections; three in 73 sections; four in 20 sections; and five in 2 sections. The most frequently occurring resource codes for sections within the DFPA were: #8 - raptor nest buffer (92 sections); #21 - greater sage-grouse nesting and raptor nest buffer (51 sections); #12 - raptor nest and big game crucial winter range (30 sections); #9 - raptor nest buffer and mountain plover habitat (28 sections); and #11 - raptor nest buffer, prairie dog colony, and mountain plover habitat (19 sections) (Appendix G). These 5 wildlife resource codes include 220 sections (58.3%) of the DFPA, and the remaining 36 codes constitute the remaining 157 (41.7%) sections. Sections with the most wildlife resource concerns were generally located in the northwest, northeast, and southeast corners of the DFPA and along the extreme southern edge of the DFPA. The central portion of the DFPA tended to have fewer wildlife resource concerns present. The more wildlife resources that are present within a section the greater the potential for impacts from disturbance. Therefore, when 4-5 wildlife resource concerns are present within a section (22 sections), the BLM may consider a reduction in the number of well locations (< 4) allowed within that section if well

placement does not adequately avoid the resource concerns within the section. If this approach is followed, significant impacts are not expected.

The areas within the DFPA where wildlife resource concerns overlap are illustrated in Figure 4-7. Forty-seven combinations of overlapping wildlife resource concerns were identified within the DFPA; these are listed in detail in the Wildlife and Fisheries Technical Report for this project (HWA 2002). The maximum number of overlapping resource concerns is 4. Nearly 3/4 of the DFPA (173,252 acres; 74.1%) contains at least one wildlife resource concern. The 5 types of wildlife concerns that covered the most area within the DFPA were: raptor nest buffer areas (70,561 acres), greater sage-grouse lek buffer areas (28,309 acres), overlap of raptor nest and greater sage-grouse lek buffers (17,363 acres), mule deer crucial winter/yearlong range (11,059 acres), and potential mountain plover habitat (8,590 acres). Together, these 5 types cover 135,884 acres, or 58.1% of the DFPA. The remaining 42 types of overlapping wildlife concerns cover 37,422 acres, or 16% of the DFPA. The area of the DFPA that contains overlapping wildlife resources is: no known wildlife resources, 60,291 acres; 1 wildlife resource, 120,808 acres; 2 overlapping resources, 45,618 acres; 3 overlapping resources, 6,590 acres; and 4 overlapping resources, 235 acres. The more wildlife resource concerns overlap, the greater the potential for impacts resulting from disturbance.

4.7.3.2 Alternative A

As described in detail in Section 2.3, a total of 592 new natural gas wells would be drilled and developed on a total of 555 new well locations under Alternative A during the 20-year construction period. Development at this level would impact approximately 7,582 acres of wildlife habitat over the next twenty years including a total of 161 acres for ancillary facilities. Approximately 3,300 acres would remain disturbed following reclamation. It is assumed that maximum well pad density would be 4 per section. Well placement within the DFPA is not known at this time, therefore it was assumed that any section may potentially be developed.

4.7.3.2.1 General Wildlife

The analysis for Alternative A is identical to that presented under the Proposed Action (4.7.4.1.1) except that the potential for impacts under Alternative A is proportionately higher than the Proposed Action because of the greater number of well pads (555 v. 361) and post-reclamation disturbance (3,300 v 2,139 acres).

4.7.3.2.2 Big Game

<u>Pronghorn Antelope</u>

The analysis of potential impacts to pronghorn due to habitat loss, displacement, and vehicle collisions is identical to that presented under Proposed Action (4.7.4.1) except that the potential for significant impacts under Alternative A is proportionately greater than the Proposed Action because of the increased number of well locations (555 v. 361) and post-reclamation disturbance (3,300 v. 2,139 acres).

Mule Deer

The analysis of potential impacts to mule deer due to habitat loss, displacement, and vehicle collisions is identical to that presented under Proposed Action (4.7.4.1) except that the potential for significant impacts under Alternative A is proportionately greater than the Proposed Action because of the increased number of well locations (555 v. 361) and post-reclamation disturbance (3,300 v. 2,139 acres).

White-tailed Deer

The analysis for this alternative is identical to that presented under the Proposed Action (4.7.3.1).

Elk

The analysis of potential impacts to elk due to habitat loss, displacement, and vehicle collisions is identical to that presented under Proposed Action (4.7.3.1) except that the potential for significant impacts under Alternative A is proportionately greater than the Proposed Action because of the increased number of well locations (555 v. 361) and post-reclamation disturbance (3,300 v. 2,139 acres).

Overlapping Big Game Crucial Winter Range

The analysis of potential impacts to overlapping big game crucial winter ranges due to habitat loss is identical to that presented under Proposed Action (4.7.3.1) except that the potential for significant impacts under Alternative A is proportionately greater than the Proposed Action because of the increased number of well locations (555 v. 361) and post-reclamation disturbance (3,300 v. 2,139 acres).

4.7.3.2.3 Wild Horses

The analysis of potential impacts to wild horses due to habitat loss and displacement is identical to that presented under Proposed Action (4.7.3.1) except that the potential for significant impacts under Alternative A is proportionately greater than the Proposed Action because of the increased number of well locations (555 v. 361) and post-reclamation disturbance (3,300 v. 2,139 acres).

4.7.3.2.4 Upland Game Birds

Greater Sage-grouse. The analysis of potential impacts to greater sage-grouse is identical to that presented under Proposed Action (4.7.3.1) except that the potential for significant impacts under Alternative A is proportionately greater than the Proposed Action because of the increased number of well locations (555 v. 361) and post-reclamation disturbance (3,300 v. 2,139 acres).

Mourning Dove. The analysis of potential impacts to the mourning dove is identical to that presented under Proposed Action (4.7.3.1).

4.7.3.2.5 Raptors

The analysis of potential impacts to raptors due to habitat loss and displacement is identical to that presented under Proposed Action (4.7.3.1) except that the potential for significant impacts under Alternative A is proportionately greater than the Proposed Action because of the increased number of well locations (555 v. 361) and post-reclamation disturbance (3,300 v. 2,139 acres).

4.7.3.2.6 Combinations of Wildlife Concerns

The analysis for Alternative A is identical to that presented under the Proposed Action (4.7.4.1.6) except that the potential for impacts under Alternative A is proportionately higher than the Proposed Action because of the greater number of well locations (555 v. 361) and post-reclamation disturbance (3,300 v 2,139 acres).

4.7.3.3 Alternative B - No Action

Under the No Action Alternative, the Proposed Action would not be implemented and further drilling would be allowed on federal lands to the extent that it would be within the scope of existing environmental analyses (Mulligan Draw and Dripping Rock decisions) and individual APD's that would be approved on a case-by-case basis. Wildlife resource impacts would be similar to those described above. In terms of magnitude, such impacts would likely be slightly less than for the Proposed Action.

4.7.4 Impacts Summary

The implementation of the Proposed Action or Alternative A would result in direct losses of habitat from surface disturbance associated with the construction of well sites and related access roads and pipelines. In addition, some wildlife species would be indirectly impacted by temporary displacement from habitats in the vicinity of the project area due to the presence of human activities associated with the construction and operation of wells. The potential for collisions between wildlife and motor vehicles would also increase due to the construction of new roads and increased traffic levels on existing roads. The severity of these impacts would be expected to decrease with the completion of the construction phase and with the onset of reclamation efforts on many of the disturbed areas.

The nature of impacts to wildlife is similar between the Proposed Action and Alternative A. The magnitude of potential impacts would be greater under Alternative A, because of the greater number of well sites and increased number of miles of associated access roads and pipelines. The implementation of the Proposed Action would result in 35.1 percent less wildlife habitat being affected than under Alternative A. The implementation of Alternative B would result in wildlife and their habitat being affected within the scope of existing environmental analyses and case-by-case situations, limiting disturbance in comparison to the Proposed Action.

Impacts to the wildlife species in Section 4.7.4 resulting from development of the Proposed Action or Alternative A are not expected to meet the significance criteria in Section 4.7.2 following implementation of the mitigation measures in Sections 2.5.2.11.2 and 4.7.6 because: (1) impacts would not result in non-compliance with existing BLM, FWS, or WGFD management objectives for wildlife; (2) impacts would not cause a substantial increase in direct mortality of wildlife; (3) crucial wildlife habitats would not be permanently reduced in size or rendered unsuitable; (4) long-term

declines in recruitment and/or survival of wildlife populations are not expected; and (5) reproductive success of greater sage-grouse and raptors would not be threatened.

4.7.5 Additional Mitigation Measures

In addition to mitigation measures outlined in Section 2.5.2.11.2, the BLM may require implementation of the following mitigation measures to minimize impacts to wildlife species:

- In areas of overlapping big game crucial winter range, the number of locations may be reduced (less than 4) in order to minimize habitat loss.
- Off-site mitigation such as vegetation enhancement in adjacent areas may be implemented, on a site specific basis, if areas of overlapping big game crucial winter ranges are disturbed.
- Roads located in big game crucial winter range may be closed, on a site specific basis, to public use from November 15-April 30 to minimize disturbance.
- When 4-5 wildlife resource concerns are present within a section, the BLM may consider a reduction in the number of well locations (< 4) allowed within that section if well placement does not adequately avoid the resources.
- In areas where 4 wildlife resources of concern overlap, the BLM may consider avoidance of these areas in order to reduce impacts.
- No permanent above-ground structures would be constructed within 300m or less, depending upon species and/or line of sight, of any raptor nest, on a site specific basis.
- Where "take" of a raptor nest is unavoidable, the erection of 2 artificial nesting structures may be required by the BLM.
- Surface disturbance within 2 miles of greater sage-grouse leks should avoid quality nesting habitat, where possible, on a site-specific basis.

4.7.6 Residual Impacts

The additional potential mitigation measures in Section 4.7.5 would reduce potential impacts in the following ways: (1) limiting disturbance within overlapping crucial big game winter range would reduce forage loss and potential impacts to over-winter survival would be reduced, (2) vegetation enhancement adjacent to disturbed overlapping crucial winter range would provide additional forage for big game, especially during harsh winters, and potential impacts to over-winter survival would be reduced, (3) road closures would reduce disturbance to wintering big game and potential impacts to over-winter survival would be reduced, (4) reducing the number of well locations within sections with 4-5 wildlife resources would reduce impacts to at least some of the wildlife resource concerns within those sections, (5) avoidance of areas where 4 wildlife resource concerns overlap would reduce potential impacts to those 4 wildlife resource concerns simultaneously, (6) restricting construction of structures within 300 meters of raptor nests, depending upon site specific conditions, would reduce disturbance near nests and the potential impacts of nesting territory abandonment would be reduced, (7) construction of artificial nesting structures would provide raptors alternative nesting sites, and the potential impact of reduced raptor nesting would be

reduced, and (8) avoidance of quality greater sage-grouse nesting habitat would reduce the potential impact of reduced greater sage-grouse nesting success.

4.8 SPECIAL STATUS PLANT, WILDLIFE, AND FISH SPECIES

4.8.1 Threatened, Endangered or Proposed for Listing Species of Plants, Wildlife, and Fish

In accordance with Section 7(c) of the Endangered Species Act of 1973, as amended, the Cheyenne Office of the FWS has determined that the following threatened, endangered, or species proposed for listing under the Act, may be present on the DFPA (USDI-FWS 2002a). The threatened, endangered, and proposed wildlife, fish, and plant species that may occur on or near the DFPA are listed below.

Species	Status	Expected Occurrence
Black-footed ferret (*Mustela nigripes*)	Endangered	Potential resident in prairie dog colonies.
Canada lynx (*Lynx canadensis*)	Threatened	Potential resident of forested areas.
Bald eagle (*Haliaeetus leucocephalus*)	Threatened	Potential nesting, winter resident, migrant.
Mountain plover (*Charadrius montanus*)	Proposed	Grasslands statewide.
Bonytail (*Gila elegans*)	Endangered	Downstream resident of Green River system
Colorado pikeminnow (*Ptychocheilus lucius*)	Endangered	"
Humpback chub (*Gila cypha*)	Endangered	"
Razorback sucker (*Xyrauchen texanus*)	Endangered	"
Ute ladies'-tresses	Threatened	Riparian wet meadows

4.8.1.1 Impact Significance Criteria

Impacts to species of special concern including threatened, endangered, and species proposed for listing would be considered significant if any of the following was to occur:

- Project-related impacts that jeopardized or substantially decelerated the recovery program of any listed or proposed species.
- If the BA (USDI-BLM and HWA 2002, Appendix I), according to Section 7 of the ESA of 1973, concludes a "likely to adversely affect" determination, BLM would initiate formal consultation with FWS.

4.8.1.2 Direct and Indirect Impacts

See Section 4.7.3 for discussion of the analysis approach. Wildlife habitats directly affected by the proposed project include areas which are physically disturbed by the construction of wells, roads, pipelines, and production facilities; wildlife habitats indirectly impacted include areas surrounding directly impacted habitats. Disturbance during construction and production such as human presence and noise may displace or preclude wildlife use of these areas. Wildlife sensitivity to these direct/indirect impacts varies considerably with each animal species. Potential direct and indirect impacts to threatened, endangered, and proposed wildlife and fish species are discussed in the following sections. The Wildlife Monitoring/Protection Plan (Appendix H) would be used to detect any potential unanticipated impacts to threatened, endangered, and proposed wildlife and fish species throughout the LOP.

4.8.1.2.1 Proposed Action

As described in detail in Section 2.2, a total of 385 new natural gas wells at 361 well locations would be drilled and developed under this alternative during the next 20 years with an expected life-of-project of 30-50 years. It is assumed that maximum well pad density would be 4 per section. Well placement within the DFPA is not known at this time, therefore it was assumed that any section may potentially be developed.

Nine species (two mammals, two birds, four fish, one plant) are listed as threatened, endangered, or proposed by the FWS under the ESA and may potentially be found in the project area or be affected by activities conducted on the project area (USDI-FWS 2002a). These include the black-footed ferret, Canada lynx, bald eagle, mountain plover, bonytail, Colorado pikeminnow, humpback chub, razorback sucker, and Ute ladies'-tresses.

Wildlife Species

Black-Footed Ferret. The DFPA supports white-tailed prairie dog colonies that meet the requirements for providing potential black-footed ferret habitat. White-tailed prairie dog colonies are located within portions of 67 sections of the DFPA. White-tailed prairie dog colonies were overlapped most often by both raptor nest buffer areas and mountain plover habitat (1,445 acres), followed by raptor nest buffer areas (1,276 acres) (HWA 2002). Significant impacts in these areas of overlapping resources are not expected if the mitigation measures for each of these individual resources are implemented.

Under the Proposed Action, potential black-footed ferret habitat may be disturbed if wells and associated facilities are constructed in white-tailed prairie dog colonies that meet the requirements for black-footed ferret habitat (Biggins et al. 1989, USDI-FWS 1989). Adverse impacts to black-footed ferret habitat from implementation of the Proposed Action would be avoided by not allowing surface disturbance within 50 meters of white-tailed prairie dog colonies. In the event that this can not occur, a black-footed ferret survey of suitable prairie dog towns in which ground disturbing activities are proposed would be conducted (USDI-FWS 1989). If no ferrets are found, the area would be cleared for development for one year. No ground disturbing activities would occur within a colony if a ferret is found. Through these measures, the Proposed Action is not expected to adversely affect the black-footed ferret within the project area.

Canada Lynx. Suitable habitat for this species is not available on the DFPA and no impacts are expected.

Bald Eagle. No bald eagle nests are known to occur on the project area, and WOS records (WGFD 2000a) indicate that the project area is occasionally used by this species primarily during the winter months (November through March). No winter concentration areas and/or winter night-time roosts have been documented on or within one mile of the DFPA.

Because the project area overlaps the winter ranges of major big game species, the potential for vehicle collisions with big game would increase as a result of increased vehicular traffic associated with construction of the Proposed Action. Because bald eagles commonly feed on carrion, particularly during the winter months, the presence of road-killed big game carcasses on and adjacent to the access roads is an attractant. Eagles feeding on these carcasses are in danger of being struck by moving vehicles. Because the potential for an increase in the incidence of vehicle-bald eagle encounters exists, mitigative measures to avoid and/or reduce such incidents should be taken. Such measures should include: (1) require that regular drivers undergo training describing the circumstances under which vehicular collisions with bald eagles are likely to occur and the measures that can be employed to minimize them, and (2) removal of vehicle-killed carcasses from the ROW's of access roads on the project area to eliminate the exposure of carrion-feeding eagles to the threat of being struck by vehicles.

Given the implementation of these mitigation measures, no adverse effects to bald eagles are expected.

Mountain Plover. Short grass, very short shrub, or cushion plant communities are considered potential mountain plover nesting habitat, although mixed grass prairie (i.e. shortgrass prairie dominated by blue grama and buffalo grass) on flat slopes (≤ 3%) provides optimal mountain plover nesting habitat (Parrish et al. 1993). Potential mountain plover habitat comprises a total of 10.9 percent (25,415 acres) of the DFPA. During 2000 and 2001 field surveys, plovers were observed by HWA biologists in potential mountain plover polygons totaling 9,202 acres. No plovers were observed in the remaining 16,213 acres of potential mountain plover habitat (HWA 2002). Potential mountain plover habitat is present within 104 sections of the DFPA, and 18 sections within the MVMA portion of the DFPA contain potential mountain plover habitat. Mountain plover habitat was most often overlapped by raptor nest buffer areas (6,658 acres), followed by pronghorn crucial winter/yearlong range (2,400 acres) (HWA 2002). Significant impacts in these areas of overlapping resources are not expected if the mitigation measures for each of these individual resources are implemented.

A portion of the suitable mountain plover nesting habitat may be disturbed with implementation of the Proposed Action. Impacts to mountain plovers would be minimized by avoiding construction activities in suitable plover nesting habitat during the nesting period from April 10-July 10, and/or avoiding surface disturbance within areas of suitable plover nesting habitat the remainder of the year. The status of nests may change annually, and mountain plover nest activity status and location surveys must be kept current. Any mountain plover surveys that are conducted would follow the most current mountain plover survey guidelines from the FWS (USDI-FWS 2002b). Mountain plovers often nest near roads, feed on or near roads, and use roads as travel corridors (USDI-FWS 1999), all of which make the species susceptible to being killed by vehicles. Thus, the operators may be required to warn employees about the potential for roadside and roadway use by the species. Minimization of the amount of travel done at night and driving speeds would reduce

the potential for roadkill of mountain plovers. The BLM may also identify mountain plover "occupied habitat areas" and if these areas are disturbed, additional mitigation measures may be required to minimize impacts to mountain plovers (see Section 4.8.1.4). Implementation of some of these additional measures would be agreed to by the BLM and operators. If the mountain plover is listed as a threatened species, formal consultation with the FWS would be necessary. Given the implementation of mitigation measures in Sections 2.5.2.11.2 and 4.8.1.4, no adverse effects to mountain plovers are expected.

Combinations of Wildlife Concerns. The only combination of wildlife concerns to potentially include multiple threatened, endangered, or proposed species was the overlap between mountain plover habitat and white-tailed prairie dog colonies, which may support black-footed ferrets (2,755 acres). These areas were primarily located in the northwest, northeast, and southeast corners of the DFPA (see Figure 4-7). Significant impacts in these areas are not expected provided that the mitigation measures for both of these individual resources are implemented.

Fish Species

There are four species of fish in the upper Colorado River System that are federally listed as endangered. They are the Colorado pikeminnow (*Ptychocheilus lucius*), bonytail (*Gila elegans*), humpback chub (*Gila cypha*), and razorback sucker (*Xyrauchen texanus*) (USDI-FWS 2002a). Though they currently exist only downstream of the DFPA, water draining from the DFPA affects the downstream habitat for these species. Under the *Recovery and Implementation Program for Endangered Fish Species in the Upper Colorado River Basin* (RIP), "any water depletions from tributary waters within the Colorado River drainage are considered as jeopardizing the continued existence of these fish." Tributary water is defined as water that contributes to instream flow habitat. Depletion is defined as water which would contribute to the river flow if not intercepted and removed from the system.

The BLM retains discretionary authority over individual projects within the area for the purpose of endangered species consultation. If the recovery program is unable to implement the RIP in a timely manner or make sufficient progress in recovery of these endangered species, re-initiation of Section 7 consultation may be required so that new reasonable and prudent alternatives can be developed.

The FWS has determined that progress made under the RIP has been sufficient to merit a waiver of the mitigation fee for depletions of 100 acre-feet per year or less (Memorandum dated March 9, 1995 to Assistant Regional Director, Ecological Services, Region 6, from Regional Director 6, "Intra-Service Section 7 Consultation for Elimination of Fees for Water Depletions of 100 acre-feet or Less from the Upper Colorado River Basin"). The Proposed Action would deplete approximately 29.1 acre-feet of water per year, and thus a mitigation fee waiver would be applicable.

Colorado Pikeminnow. Suitable habitat for the Colorado Pikeminnow does not exist on the DFPA. Suitable habitat does exist downstream of the DFPA, however, the Proposed Action is not expected to affect this habitat provided that mitigation measures for water and soils outlined in this document are implemented.

Bonytail. Suitable habitat for adult bonytail is absent from the DFPA and the sediment rich nature of Sand Creek likely precludes successful spawning by bonytail. Suitable habitat does exist downstream of the DFPA, however, the Proposed Action is not expected to affect this habitat provided that mitigation measures for water and soils outlined in this document are implemented.

Humpback Chub. Suitable habitat for adult humpback chub is absent from the DFPA and the sediment rich nature of Sand Creek likely precludes successful spawning by humpback chub. Suitable habitat does exist downstream of the DFPA, however, the Proposed Action is not expected to affect this habitat provided that mitigation measures for water and soils outlined in this document are implemented.

Razorback Sucker. Suitable habitat for this species is not available on the DFPA. Although the sediment rich nature of Sand Creek may be suitable for successful spawning by the razorback sucker, its small size probably precludes it from spawning in Sand Creek. Suitable habitat does exist downstream of the DFPA, however, the Proposed Action is not expected to affect this habitat provided that mitigation measures for water and soils outlined in this document are implemented.

Plant Species

Ute ladies'-tresses. The Ute ladies'-tresses is not expected to occur on or near the DFPA due to the following reasons: (1) The DFPA is very arid and perennial streams are not present, (2) the elevation of the project area is near the upper limit for the species, (3) moist riparian area meadows are not present, (4) perennial streams are not present, (5) the transition from stream margins to upland vegetation is abrupt, and (6) the species has only been located in eastern and southeastern Wyoming (Fertig 2000). Therefore, implementation of the Proposed Action is not expected to impact the Ute ladies'-tresses.

4.8.1.2.2 Alternative A

As described in detail in Section 2.3, a total of 592 new natural gas wells would be drilled and developed on a total of 555 new well pads under Alternative A during the 20-year construction period. Development at this level would impact approximately 7,582 acres of wildlife habitat over the next 20 years including a total of 161 acres for ancillary facilities. Approximately 3,300 acres would remain disturbed following reclamation. It is assumed that maximum well pad density would be 4 per section. Well placement within the DFPA is not known at this time, therefore it was assumed that any section may potentially be developed.

Wildlife Species

Black-Footed Ferret. The analysis for Alternative A is identical to that presented under the Proposed Action (4.8.1.2.1) except that the potential for impacts under Alternative A is proportionately higher than the Proposed Action because of the greater number of well pads (555 v. 361) and post-reclamation disturbance (3,300 v 2,139 acres).

Canada Lynx. The analysis for Alternative A is identical to that previously described under the Proposed Action (4.8.1.2.1).

Bald Eagle. The analysis for Alternative A is identical to that previously described under the Proposed Action (4.8.1.2.1).

Mountain Plover. The analysis for Alternative A is identical to that presented under the Proposed Action (4.8.1.2.1) except that the potential for impacts under Alternative A is proportionately higher than the Proposed Action because of the greater number of well pads (555 v. 361) and post-reclamation disturbance (3,300 v 2,139 acres).

Combinations of Wildlife Concerns. The analysis for Alternative A is identical to that previously described under the Proposed Action (4.8.1.2.1).

Fish Species

Colorado Pikeminnow. The analysis for Alternative A is identical to that previously described under the Proposed Action (4.8.1.2.1).

Bonytail. The analysis for Alternative A is identical to that previously described under the Proposed Action (4.8.1.2.1).

Humpback Chub. The analysis for Alternative A is identical to that previously described under the Proposed Action (4.8.1.2.1).

Razorback Sucker. The analysis for Alternative A is identical to that previously described under the Proposed Action (4.8.1.2.1).

Plant Species

Ute ladies'-tresses. The analysis for Alternative A is identical to that previously described under the Proposed Action (4.8.1.2.1).

4.8.1.2.3 Alternative B - No Action

Under the No Action Alternative, the Proposed Action would not be implemented and further drilling would be allowed on federal lands only to the extent that it would be within the scope of existing environmental analyses. Wells would continue to be drilled under the Mulligan Draw and Dripping Rock decisions, and individual APD's would be approved on a case-by-case basis. Wildlife resource impacts would be similar to those described above. In terms of magnitude, such impacts would likely be considerably less than for the Proposed Action. However, there would be an increased probability of occurrence of unexpected adverse impacts since overall field development would not happen in a well-planned and monitored manner.

4.8.1.3 Impacts Summary

With the implementation of the Proposed Action or Alternative A, direct loss of habitat would result from surface disturbance associated with the construction of well sites and related access roads and pipelines. Small proportions of potential mountain plover and black-footed ferret habitat may be disturbed. The potential for collisions between bald eagles and motor vehicles would also increase due to the construction of new roads and increased traffic levels on existing roads. The intensity of these impacts would decrease with the completion of the construction phase and with the onset of reclamation efforts on many of the disturbed areas. The probability for impacts to wildlife and the intensity of such impacts would be greater under Alternative A than the Proposed Action. The application of prescribed avoidance, monitoring (Wildlife Monitoring/Protection Plan,

Appendix H) and mitigation measures (Sections 2.5.2.11.2, and 4.8.1.4) would reduce the impact potential and allow for either of the action alternatives to be performed without significant impacts to listed and proposed wildlife species.

None of the 4 threatened and endangered fish species are known to occur on the DFPA, therefore there would be no direct impacts within the project area. However, the species do occur downstream of the DFPA. Water depletion as a result of project development would be much less than 100 acre-feet per year, and a mitigation fee waiver would be applicable, and significant impacts to these species are not likely. Implementation of all mitigation measures for water and soils would result in no impacts to threatened and endangered fish species located downstream. If any of these species are identified within the downstream portion of Sand Creek, the BLM should consult with the FWS and develop a protection plan for the fish. No impacts to these 4 fish species are expected to result from the implementation of either the Proposed Action or Alternative A. Suitable habitat for the Ute ladies'-tresses is not present within the DFPA, and no impacts to this species are expected.

Impacts to the wildlife species in Section 4.8.1 resulting from development of the Proposed Action or Alternative A are not expected to meet the significance criteria in Section 4.8.1.1 following implementation of the mitigation measures in Sections 2.5.2.11.2 and 4.8.1.4 because: (1) project development is not expected to jeopardize the recovery program of any listed or proposed species; and (2) the BA concluded that the proposed development is "not likely to adversely affect" the threatened, endangered, and proposed species; and (3) if the mountain plover is listed in the future, then formal consultation would be implemented.

4.8.1.4 Additional Mitigation Measures

In addition to mitigation measures outlined in Section 2.5.2.11.2, the BLM may require the following mitigation measures to minimize impacts to threatened, endangered, and proposed wildlife species:

- Surface disturbance would be placed in habitat not suitable for mountain plovers where feasible.
- Vehicle-killed wildlife would be removed from road ROW's to avoid attracting scavenging species such as bald eagles to roadways where they may be struck and killed by vehicles.
- If any of the threatened, endangered, or proposed fish species are identified within the downstream portion of Sand Creek, the BLM would consult with the FWS and develop a protection plan for the fish.

Some of the following mountain plover protection measures may be implemented following consultation between the BLM and operators if mountain plover "occupied habitat areas" are disturbed:

- To protect the identified mountain plover occupied habitat area, the proposed activity would not be allowed as proposed. An alternative such as moving the facility, directional drilling, piping and storage of condensate off the identified mountain plover occupied habitat area to a centralized facility, or other technique for the minimization of ground disturbance and habitat degradation would be required.

- To protect the identified mountain plover occupied habitat area, the proposed facility would be moved ½ mile from the identified occupied habitat area.

- To protect the identified mountain plover occupied habitat area and because mountain plover adults and broods may forage along roads during the night, traffic speed and traffic volume would be limited during night-time hours from April 10 to July 10.

- Within ½ mile of the identified mountain plover occupied habitat area, speed limits would be posted at 25 mph on resource roads and 35 mph on local roads during the brood rearing period (June 1 - July 10).

- The access road would be realigned to avoid the identified mountain plover occupied habitat area.

- To protect the identified mountain plover occupied habitat area, traffic would be minimized from June 1 - July 10 by car-pooling and organizing work activities to minimize trips on roads within ½ mile of the mountain plover occupied habitat area.

- To protect the identified mountain plover occupied habitat area, work schedules and shift changes would be modified from June 1 - July 10 to avoid the periods of activity from ½ hour after sunset to ½ hour before sunrise.

- To protect the identified mountain plover occupied habitat area, fences, storage tanks, and other elevated structures would be either constructed as low as possible and/or would incorporate perch-inhibitors into their design.

- Road-killed animals would be promptly removed from areas within ½ mile of the identified mountain plover occupied habitat area.

- To protect the identified mountain plover occupied habitat area, seed mixes and application rates for reclamation would be designed to produce stands of sparse, low-growing vegetation suitable for plover nesting.

- To minimize destruction of nests and disturbance to breeding mountain plovers, no reclamation activities or other ground-disturbing activities would occur from April 10 - July 10 unless surveys consistent with the Plover Guidelines or other FWS approved method find that no plovers are nesting in the area.

- A plugged and abandoned well within ½ mile of the identified mountain plover occupied habitat area would be identified with a marker 4 feet tall with a perch inhibitor on the top of the marker.

4.8.1.5 Residual Impacts

The additional potential mitigation measures in Section 4.8.1.4 would reduce potential impacts in the following ways: (1) avoidance of disturbance within potential mountain plover habitat would reduce the potential impacts associated with loss of habitat such as reduction in the number of nesting mountain plovers or reduced mountain plover nesting success, (2) removal of carcasses from roads would reduce the potential for direct mortality of species such as bald eagles, (3) if threatened or endangered fish species are found in Sand Creek, consultation with the FWS would

be implemented to reduce potential impacts to these species, (4) implementation of some of the additional mountain plover protection measures would reduce impacts to habitat known to be occupied by mountain plovers, and impacts to nesting mountain plovers would be reduced.

4.8.2 Sensitive Species of Plants, Wildlife, and Fish

Sensitive species includes candidate T&E species and BLM Wyoming State sensitive species (USDI-BLM 2001). A total of 21 plant and 35 wildlife and fish species that have the potential to occur, or are known to occur in the project area, are included as sensitive species (Table 3-24). Although these species have no legal status under the ESA, the BLM maintains an active interest in their numbers and status. The BLM views "management of sensitive species as an opportunity to practice pro-active conservation; this management should not be onerous, or a show-stopper of other legitimate, multiple use activities" (USDI-BLM 2001). The BLM's order of priority for the management of all special status species is: First - listed T&E species; Second - proposed T&E species; Third - candidate T&E species; Fourth - BLM sensitive species; and, Fifth - State listed species (USDI-BLM 2001). The BLM Wyoming Sensitive Species list is meant to be dynamic and will be reviewed annually.

4.8.2.1 Impact Significance Criteria

Impacts to BLM Wyoming state sensitive plant, wildlife, and fish species would be considered significant if the following was to occur:

- Project-related impacts jeopardize the persistence of any BLM Wyoming state sensitive plant, wildlife, or fish species within the state.

4.8.2.2 Direct and Indirect Impacts

See Section 4.7.3 for discussion of the analysis approach. Wildlife habitats directly affected by the proposed project include areas which are physically disturbed by the construction of wells, roads, pipelines, and production facilities; wildlife habitats indirectly impacted include areas surrounding directly impacted habitats. Disturbance during construction and production such as human presence and noise may displace or preclude wildlife use of these areas. Wildlife sensitivity to these direct/indirect impacts varies considerably with each animal species. The potential for impacts to sensitive wildlife species in the portion of the DFPA located within the MVMA is similar to the potential for impacts in the remainder of the DFPA unless otherwise indicated. Potential direct and indirect impacts to sensitive wildlife species are discussed in the following sections. The Wildlife Monitoring/Protection Plan (Appendix H) would be used to detect any potential unanticipated impacts to sensitive wildlife and fish species throughout the LOP.

4.8.2.2.1 Proposed Action

Plants

Management directions emphasize the need to protect plant species of concern. Surface disturbing activities could affect plant species of concern directly and indirectly by destroying individuals or their habitat, increasing the amount of fugitive dust, and introducing invasive, non-native species. The only BLM Wyoming state sensitive plant currently known to occur within the DFPA is Gibbens' beardtongue. The BLM is particularly concerned for the population of Gibbens' beardtongue known

to occur in the eastern portion of the project area. Final planning for the location and alignment of project facilities in this area would require taking the occurrence and distribution of this species into consideration. Avoidance of areas containing the species would eliminate direct impact on the species. Should populations of additional BLM state sensitive plant species be found within the DFPA, similar avoidance measures may be required to avoid significant direct impacts to the those species. Fugitive dust generated during project construction and operation could adversely affect vegetation including sensitive plant species due to deposition on leaves. Although deposition of dust on leaves could have an adverse effect, the magnitude of this impact would likely be minimal. Fugitive dust control has been adopted by the Operators as described in Appendix C, and therefore such an impact would be minimal. With implementation the mitigation recommended in Section 2.5.2.11.2, no significant impacts to sensitive plant species are anticipated under the Proposed Action.

Wildlife

Dwarf Shrew. Dwarf shrews have been captured in eastern Sweetwater County and may be present on the DFPA. Dwarf shrews appear to be able to survive in a wide range of habitats from high altitude alpine tundra to alkaline sagebrush flats. The small percentage of habitat proposed for disturbance within the DFPA under the Proposed Action is not expected to significantly impact dwarf shrews if they are present.

Idaho Pocket Gopher. Idaho pockets gophers have only been confirmed in extreme western Sweetwater County, and they are unlikely to occur on the DFPA. No significant impacts to this species are expected.

Wyoming Pocket Gopher. It is likely that the Wyoming pocket gopher is present in portions of the DFPA. This species utilizes dry ridge tops with dry gravelly soils and greasewood. This species may be abundant within its distribution, but no population studies have been conducted (Clark and Stromberg 1987). No significant impacts to this species are expected with development of the Proposed Action.

Pygmy Rabbit. Pygmy rabbits have been found in western Sweetwater County, which is west of the DFPA. However, the extent of the pygmy rabbit's range in Wyoming is not well known, therefore there is a slight possibility that it may occur in suitable habitat (tall dense sagebrush) in the project area. The small percentage of disturbance on the project area associated with the Proposed Action is not expected to be a significant impact upon pygmy rabbits if they are present.

White-tailed Prairie Dog. White-tailed prairie dog colonies that may provide habitat suitable for black-footed ferrets are present on the project area. If white-tailed prairie dog colonies that provide suitable black-footed ferret habitat are to be disturbed, then black-footed ferret surveys would be conducted (see Section 4.8.1.2.1). It is preferred by the BLM that no disturbance occur within 50 meters of prairie dog colonies, where feasible. The anticipated disturbance of white-tailed prairie dog colonies is expected to be low, and no significant impacts to white-tailed prairie dogs are expected.

Swift Fox. The direct disturbance of 4,923 acres of mixed desert shrub and badlands habitat associated with the construction of the proposed action would reduce habitat availability and effectiveness for swift fox if present. Through reclamation, the amount of disturbance would be

reduced to 2,139 acres. Swift foxes are very adaptable, and this amount of disturbance would not be a significant impact if they are present on the DFPA.

Special Concern Bat Species. The project area provides potential habitat for four special status bat species which include: the spotted bat, fringed myotis, long-eared myotis, and Townsend's big eared bat. Although their distributional ranges overlap the project area, it is difficult to verify their occurrence in the area without extensive mist netting efforts. Bats may potentially use vent pipes associated with well facilities as roost sites. Netting of vents where bats may potentially be killed would prevent this possible impact. The Proposed Action is unlikely to affect other activities of bats such as foraging, food supply, or roosts.

Baird's Sparrow. Because Baird's sparrow is so unlikely to utilize the DFPA except for possible occurrences during late summer or during migration periods, no adverse impacts to this species are expected to result from the implementation of the Proposed Action.

Sage Sparrow. Sage sparrows do occur on the DFPA. Sage sparrows typically utilize stands of big sagebrush or mixed big sagebrush and greasewood for nesting. This is the type of habitat that covers approximately74% of the project area. The proportion of this habitat that may be disturbed is expected to be low, therefore, impacts upon sage sparrows are expected to be minimal.

Brewer's Sparrow. The Brewer's sparrow breeds in landscapes dominated by big sagebrush (*Artemisia tridentata*) throughout the Great Basin and intermountain West (Rotenberry et al. 1999). Brewer's sparrows are known to occur in the southwestern portion of the project area, but are likely present throughout the project area where suitable habitat occurs. Development of the Proposed Action would likely displace some Brewer's sparrows, however, suitable habitat is very abundant throughout the project area, and therefore, no significant impacts to this species are expected.

Long-billed Curlew. Long-billed curlews prefer nesting in arid regions of grassland and shrub habitats of the western plains, and nests are usually located within close proximity to open lakes and sloughs (Dinsmore 1983). In Wyoming, it is an uncommon summer resident. The long-billed curlew has been observed in Carbon and Sweetwater counties, but it has not been reported within the DFPA. The long-billed curlew is not expected to nest on the project area due to lack of habitat, and no significant impacts to this species are expected with implementation of the Proposed Action.

Sage Thrasher. The sage thrasher is considered a sagebrush obligate and is generally dependent on large patches and expanses of sagebrush steppe for successful breeding. Sage thrashers have been observed throughout Wyoming, including areas near the DFPA (WGFD 2000a). Development of the Proposed Action would likely displace some sage thrashers, however, suitable habitat is very abundant throughout the project area, and no significant impacts to this species are expected.

Western Burrowing Owl. Burrowing owls occur throughout the DFPA in many of the prairie dog towns. The number of burrowing owl observations within the DFPA indicate that surveys for this species should be made prior to construction in prairie dog colonies during the owl breeding/nesting season. If nesting owls are found, the same measures used for other raptor species (see Section 4.7.4.1.6) would be applied. Given these precautionary measures, no adverse impacts to this species are expected to result from the implementation of the Proposed Action.

Yellow-billed Cuckoo. In Wyoming, the yellow-billed cuckoo prefers cottonwood stands for foraging and willow thickets for nesting (WYNDD 2001). Yellow-billed cuckoos have not been observed on or near the project area (WGFD 2000a) and they are not expected to occur due to a lack of suitable habitat. No adverse impacts to this species are expected from implementation of the Proposed Action.

Loggerhead Shrike. Loggerhead shrikes have been observed within the DFPA. Four of the sightings included a pair or more of shrikes, possibly indicating breeding pairs. This species uses thickly foliaged trees and shrubs for nesting and roosting. Construction within this type of habitat may possibly disturb nesting shrikes. However, facilities associated with well development may provide increased perching sites, which shrikes use for hunting. Implementation of the Proposed Action is not likely to adversely effect the loggerhead shrike.

Columbian Sharp-tailed Grouse. There are no historic Columbian sharp-tailed grouse leks documented within the DFPA. No sightings of Columbian sharp-tailed grouse have been reported for the DFPA and no habitat is known to occur within the project area. The species does occur several miles to the east; so the potential for transient Columbian sharp-tailed grouse to be found within the DFPA does exist. The absence of documented leks within the project area makes Columbian sharp-tailed grouse nesting highly improbable, therefore, implementation of the Proposed Action is not likely to adversely effect the Columbian sharp-tailed grouse.

Greater Sage-grouse. See Section 4.7.4.1.5.

White-faced Ibis. White faced ibis feed in wet meadows and shallow water found along streams and lakes and nest in areas with extensive water (Dinsmore 1983). White-faced ibis were observed east of the project area in Muddy Creek near Dad, Wyoming in 1988 (one individual) and 1992 (two individuals) (WGFD 2000a). Riparian habitat is very limited on the DFPA, therefore white-faced ibis are not expected to nest on the project area. The Proposed Action is not expected to significantly impact the white-faced ibis.

Trumpeter Swan. The arid conditions prevailing throughout the DFPA combined with the near absence of large water bodies and perennial streams preclude nesting and residency by trumpeter swans. No trumpeter swans have been documented in the DFPA. Therefore, implementation of the Proposed Action would not impact this species.

Peregrine Falcon. Peregrine falcons normally nest on cliff faces 200 to 300 feet high, although cliffs as high as 2,100 feet have been used (USDI-FWS 1984). An available prey base of shorebirds, waterfowl, and/or small-to-medium sized terrestrial birds usually occurs within ten miles of the nest site. Bird populations in and around the project area may be abundant and diverse enough to support peregrines. However, cliffs high enough to provide suitable nesting habitat are absent. In addition to the apparent lack of suitable habitat, no peregrine sightings have been recorded within the project area (WGFD 2000a). However, peregrine falcons have been observed in Carbon and Sweetwater counties (WYNDD 2001). Peregrine falcons may at times migrate through the project area, but nesting by this species on or near the project area is unlikely. Implementation of the Proposed Action is not expected to significantly impact peregrine falcons.

Ferruginous Hawk. Ferruginous hawks are known to occur and nest on the DFPA. The primary potential impact to ferruginous hawks from project activities is disturbance during nesting, resulting in reproductive failure. This potential impact would be mitigated by implementing measures that were discussed in Section 4.7.4.1.6 for all raptor species. An activity status survey of raptor nests would be conducted immediately prior to construction near nests to allow for well placement planning and avoidance of impacts to actively nesting birds. With the implementation of mitigation measures in Sections 2.5.2.11.2 and 4.7.6, development of the Proposed Action would not significantly impact the ferruginous hawk.

Northern Goshawk. Due to the facts that: (1) the coniferous nesting habit preferred by this species does not occur on the project area, (2) no nests have been discovered on the project area and two-mile buffer by either the BLM or during recent raptor nest surveys (HWA 2002), and (3) there are no records of nests in either the WOS (WGFD 2000a) or the WYNDD (2000), it is unlikely that goshawks nest on or near the project area and no impacts are expected.

Midget-faded Rattlesnake. In Wyoming, the midget-faded rattlesnake inhabits the lower Green River valley from the cities of Green River and Rock Springs south to the Utah-Wyoming state line. In southwestern Sweetwater County the midget faded rattlesnake is commonly found among rock outcroppings (Baxter and Stone 1992). The documented distribution of the midget-faded rattlesnake in Wyoming is west of the DFPA. However, the eastern extent of its range is not well known and the snake could potentially occur in suitable habitat on the project area. Potential impacts to midget-faded rattlesnake habitat would likely be low because it is difficult to construct well sites and roads in rock outcropping areas, therefore those areas would likely be avoided. Implementation of the Proposed Action is not expected to significantly impact midget-faded rattlesnakes if present.

Boreal Toad. In Wyoming, this species is restricted to mountains and foothills in areas having relatively moist conditions. The range for boreal toads is thought to encompass the Muddy Creek watershed located just east of the project area (Baxter and Stone 1992), and the Wyoming Species Atlas (WGFD 1999) and WYNDD (2001) indicate sightings within both Sweetwater and Carbon counties. However, no sightings of this species within six miles of the project area have been reported in the WOS (WGFD 1999). Habitat within the majority of the DFPA is too arid for this species to be present. Implementation of the Proposed Action is not expected to significantly impact the boreal toad if it is present.

Great Basin Spadefoot Toad. In Wyoming, this species inhabits sagebrush communities at lower elevations, mostly in the Wyoming Basin and the Green River Valley. Sightings of this species have been documented in Sweetwater, Lincoln, Fremont, and Natrona counties of Wyoming (Baxter and Stone 1992) and this species has potential to occur throughout the DFPA. One Great Basin spadefoot was reported within 2 miles of the DFPA (WGFD 2000a). This species may congregate around intermittent springs, seeps, or waterholes. If measures are taken to avoid disturbance of natural springs, seeps, and waterholes, no adverse impacts to this species are expected from implementation of the Proposed Action.

Northern Leopard Frog. The northern leopard frog is an obligate of permanent water in the plains, foothills, and montane zones. Rarely, this frog may be found near temporary water, miles from permanent water. Sightings of this species have been documented in all counties of Wyoming and this species is likely present in any areas of the DFPA having perennial water. If measures are taken to avoid disturbance and/or contamination of perennial water sources (see

water and soil sections of this document) within the DFPA, no adverse impacts to this species are expected from implementation of the Proposed Action.

Spotted Frog. The spotted frog typically occurs near cool, permanent, quiet waters such as small streams, rivers, marshes, ponds, sloughs, and springs. Spotted frogs have not been found within a six-mile perimeter of the project area and it is unlikely that suitable habitat occurs on the project area. Implementation of the Proposed Action would not impact the spotted frog.

Combinations of Wildlife Concerns. Specific locations of sensitive wildlife and fish species are limited, and areas where multiple species of concern may overlap have not been identified. If habitat areas that support 4 or more wildlife species of concern are identified in the future, the BLM may develop mitigation measures to ensure that these areas are not significantly impacted by future development. The Wildlife Monitoring/Protection Plan (Appendix H) may be used as a tool to monitor these sensitive species.

Fish

Leatherside Chub. The leatherside chub is restricted to small streams of the Snake, Bear, and Green River watersheds in western Wyoming. The leatherside chub is not known to occur, nor is it expected to occur, within the DFPA, therefore, implementation of the Proposed Action would not impact the leatherside chub.

Roundtail Chub. This species is present within the Little Snake River drainage downstream of the Sand Creek confluence and can also be found in Muddy Creek (Carbon County, Wyoming), a small perennial stream located just to the east of the project area (Baxter and Stone 1995). The absence of perennial water in the downstream portion of Sand Creek and the sediment rich nature of the stream probably preclude successful spawning by roundtail chub in the DFPA. If measures identified in the water and soils sections of this document are taken to prevent downstream sedimentation caused by construction activities under the Proposed Action (WDEQ 1997b, 2000), implementation of the Proposed Action is not likely to adversely affect the roundtail chub.

Bluehead Sucker. This species is known to occur downstream of Sand Creek in the Little Snake River and is found in Muddy Creek (Baxter and Stone 1995). However, populations of the species in Wyoming are considered rare in comparison with other sucker species. If measures identified in the water and soils sections of this document are taken to prevent downstream sedimentation caused by construction activities under the Proposed Action (WDEQ 1997b, 2000), implementation of the Proposed Action is not likely to adversely affect the bluehead sucker.

Flannelmouth Sucker. Because of the types of available stream habitat on the DFPA, this species is not expected to occur. The species does occur downstream in the Little Snake River. If measures identified in the water and soils sections of this document are taken to prevent downstream sedimentation caused by construction activities under the Proposed Action (WDEQ 1997b, 2000), implementation of the Proposed Action is not likely to adversely affect the flannelmouth sucker.

Colorado River Cutthroat Trout. Some of the most genetically "pure" of the remaining populations of this trout subspecies are found in the Little Snake River in Carbon County, Wyoming (Baxter and Stone 1995). This species occurs downstream from the Sand Creek confluence with the Little Snake River. This species requires very low sediment streams with excellent water

quality. If precautions are utilized to protect downstream flows in Sand Creek and the Little Snake River, and precautions are taken to limit offsite sediment movement, implementation of the Proposed Action is not likely to adversely affect the Colorado River cutthroat trout.

4.8.2.2.2 Alternative A

Plants

The analysis for Alternative A is similar to that previously described under the Proposed Action, but the potential for impacts is higher than for the Proposed Action because of the greater amount of habitat disturbance.

Wildlife

Dwarf Shrew. The analysis for Alternative A is identical to that previously described under the Proposed Action.

Idaho Pocket Gopher. The analysis for Alternative A is identical to that previously described under the Proposed Action.

Wyoming Pocket Gopher. The analysis for Alternative A is similar to that previously described under the Proposed Action, but the potential for impacts is higher than for the Proposed Action because of the greater amount of habitat disturbance.

Pygmy Rabbit. The analysis for Alternative A is similar to that previously described under the Proposed Action, but the potential for impacts is higher than for the Proposed Action because of the greater amount of habitat disturbance.

White-tailed Prairie Dog. The analysis for Alternative A is similar to that previously described under the Proposed Action, but the potential for impacts is higher than for the Proposed Action because of the greater amount of habitat disturbance.

Swift Fox. The analysis for Alternative A is identical to that previously described under the Proposed Action.

Special Concern Bat Species. The analysis for Alternative A is similar to that previously described under the Proposed Action, but the potential for impacts is higher than for the Proposed Action because of the greater number of well pads proposed (555 v. 361) and an increase in the number of reserve pits.

Snowy Plover. The analysis for Alternative A is identical to that previously described under the Proposed Action.

Baird's Sparrow. The analysis for Alternative A is identical to that previously described under the Proposed Action.

Sage Sparrow. The analysis for Alternative A is similar to that previously described under the Proposed Action, but the potential for impacts is higher than for the Proposed Action because of the greater amount of habitat disturbance.

<u>Brewer's Sparrow</u>. The analysis for Alternative A is similar to that previously described under the Proposed Action, but the potential for impacts is higher than for the Proposed Action because of the greater amount of habitat disturbance.

<u>Long-billed Curlew</u>. The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Sage Thrasher</u>. The analysis for Alternative A is similar to that previously described under the Proposed Action, but the potential for impacts is higher than for the Proposed Action because of the greater amount of habitat disturbance.

<u>Western Burrowing Owl.</u> The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Scott's Oriole.</u> The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Yellow-billed Cuckoo</u>. The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Loggerhead Shrike.</u> The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Columbian Sharp-tailed Grouse</u>. The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Greater Sage-grouse</u>. See Section 4.7.4.2.5.

<u>Black Tern</u>. The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>White-faced Ibis</u>. The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Trumpeter Swan</u>. The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Peregrine Falcon</u>. The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Ferruginous Hawk.</u> The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Northern Goshawk.</u> The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Midget-faded Rattlesnake</u>. The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Boreal Toad</u>. The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Great Basin Spadefoot Toad</u>. The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Northern Leopard Frog</u>. The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Spotted Frog</u>. The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Combinations of Wildlife Concerns.</u> The analysis for Alternative A is identical to that previously described under the Proposed Action.

Fish

<u>Leatherside Chub</u>. The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Roundtail Chub</u>. The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Bluehead Sucker</u>. The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Flannelmouth Sucker</u>. The analysis for Alternative A is identical to that previously described under the Proposed Action.

<u>Colorado River Cutthroat Trout</u>. The analysis for Alternative A is identical to that previously described under the Proposed Action.

4.8.2.2.3 Alternative B - No Action

Under the No Action Alternative, the Proposed Action would not be implemented and further drilling would be allowed on federal lands to the extent that it would be within the scope of existing environmental analyses (Mulligan Draw and Dripping Rock decisions), and individual APD's would be approved on a case-by-case basis. Special status wildlife resources impacts would be similar to those described above. In terms of magnitude, such impacts would likely be considerably less than for the Proposed Action.

4.8.2.3 Impacts Summary

With the implementation of the Proposed Action or Alternative A, direct loss of habitat would result from surface disturbance associated with the construction of well sites and related access roads and pipelines. Small proportions of potential habitat for several sensitive species may be disturbed. The intensity of these impacts would decrease with the completion of the construction phase and with the onset of reclamation efforts on many of the disturbed areas. The probability for impacts to sensitive plants and wildlife and the intensity of such impacts would be greater under Alternative

A than the Proposed Action. The application of prescribed avoidance, monitoring (Wildlife Monitoring/Protection Plan, Appendix H) and mitigation measures (Sections 2.5.2.11.2, and 4.8.1.4) would reduce the impact potential and allow for either of the action alternatives to be performed without significant impacts to sensitive plant and wildlife species.

None of the 5 sensitive fish species are known to occur on the DFPA, therefore there would be no direct impacts within the project area. However, several of the species do occur downstream of the DFPA. Water depletion as a result of project development would be much less than 100 acre-feet per year, and no significant impacts to these 5 fish species are expected to result from the implementation of either the Proposed Action or Alternative A.

Impacts to the species in Section 4.8.2 resulting from development of the Proposed Action or Alternative A are not expected to meet the significance criteria in Section 4.8.2.1 following implementation of the mitigation measures in Sections 2.5.2.11.2 and 4.8.2.4 because project development is not expected to jeopardize the persistence of these species in Wyoming.

4.8.2.4 Additional Mitigation Measures

In addition to mitigation measures outlined in Section 2.5.2.11.2, the BLM may require the following mitigation measures to minimize impacts to sensitive wildlife and fish species:

- Surveys for BLM state sensitive species would be conducted on a site-specific basis if deemed necessary by the BLM,

- Screening would be applied on vent pipes at compressor stations to prevent bats from using them as roost sites.

4.8.2.5 Residual Impacts

The additional mitigation measures in Section 4.8.2.4 would reduce potential impacts to special status species in the following ways: (1) surveys for BLM state sensitive species would be used to determine if sensitive species are present in certain areas, and appropriate measures could be implemented to reduce potential impacts, and (2) screening on vent pipes would reduce the potential for sensitive bat species to be killed in pipes.

4.9 RECREATION RESOURCES

4.9.1 Introduction

Well drilling, testing, and production operations, and associated site preparation and construction activities such as those proposed for the DFPA have the potential to cause major alterations to the recreation setting and recreation opportunities available to persons using the area. Some recreationists could be temporarily or permanently displaced from using certain locations associated with drilling and production activities. Displacement of recreationists could also result from changes in the numbers or distribution patterns of wildlife that attract hunters and wildlife observers to the area. The presence of construction and drilling equipment and associated increased evidence of human industrial activities in the area could detract from the recreational

experience. Noise and fugitive dust associated with drilling and production could further degrade the experience of those recreating in the area.

4.9.2 Impact Significance Criteria

The following criteria were used to evaluate the potential significance of recreation impacts:

- Levels or patterns of project equipment and vehicle use that would result in the displacement of recreation activities for more than one season of use, and
- Increased evidence of human activity that would reduce recreationists' perceived levels of isolation and solitude.

4.9.3 Direct and Indirect Impacts

4.9.3.1 Proposed Action

The following discussion assumes a non uniform distribution of wells and support facilities across the landscape with a maximum density of 1 well within the MVMA portion of the DFPA and maximum density of 4 wells per section in the remainder of the DFPA. Impacts to recreation would involve a temporary displacement of hunters, particularly during construction and drilling of 385 wells at 361 locations over 20 years. Some hunters perceive these activities as displacing game species and creating an environment that detracts from the hunting experience. Hunter displacement would be highest during the pronghorn season when most users are in the area. The proposed drilling schedule would displace hunters from an area or areas within the Desolation Flat project boundaries from 2003-2023, twenty hunting seasons. Hunter options to relocate to other hunting areas within the region are becoming increasingly constrained. The extent of oil and gas development in the region makes it difficult to find hunting opportunities in more natural settings where isolation and solitude persist. The Adobe Town WSA and MVMA are the largest and closest relocation possibilities with these characteristics. However, 23 square miles of the MVMA, 14 of which are on BLM administered property, are also included in the DFPA. The MVMA and WSA are generally higher in elevation than the DFPA. Hunters (or other recreationists) looking south and east could view oil and gas facilities and activities both within the MVMA and east of the WSA. The extent to which these would be visible would depend on specific siting of wells, roads, and other facilities, and the presence of fugitive dust. The level of disturbance to the visual resource and oil field activities could reduce the number of users. There are no areas in the region with the isolation and solitude characteristics of Adobe Town/Monument Valley to which hunters could relocate.

Undisturbed landscapes, isolation and solitude are often important to non-consumptive users such as photographers and back packers. Project related disturbances that adversely impact the characteristic landscape could also contribute to a decline in the recreation experience for these users. The recreation experience for those continuing to use the area would be less satisfying than use under the pre-disturbance conditions described in Chapter 3.

The affects described above would diminish once drilling and construction were completed in the area being drilled. However, they would persist at reduced levels for the next 30 to 50 years, particularly where well densities reach 4 wells per 640 acres.

Patterns of game use and population densities may change as a result of the project. Some long term displacement, permanent or relocation, of hunters and non-consumptive users would result. Further, there may be reduced levels of satisfaction for those recreationists who might continue to use the area. Overall impacts to the recreation resource, although substantial, would not be considered significant due to the short term nature of drilling and construction activities in any single area, sequential patterning of drilling activities during any one drilling season, and small number of recreationists affected in the long term.

MVMA and WSA

Impacts to recreation resources resulting from 13 wells in the MVMA would be considered significant because adjacent Adobe Town and MVMA are two of the few remaining areas in the region with landscape characteristics that provide isolation and solitude. There may be some displacement of users from other areas within the DFPA to more pristine landscapes such as the WSA and MVMA. However, as previously noted, 23 square miles of MVMA are also part of the project area, and depending on the intensity and location of development, the MVMA may not retain the level of isolation and solitude recreationists seek.

No drilling will occur in the WSA. However, drilling and production could occur along the 21 miles of common boundary interface between the WSA and DFPA. Well density along this interface could be at 4 wells per section in some locations. Noise, fugitive dust, and the industrial character of drilling and production would adversely impact the pristine WSA landscape diminishing the area's attributes of solitude and isolation sought by WSA recreationists. These activities would likely produce both short term and long term impacts to recreation resources in the adjacent WSA. Mitigation of noise, dust, and visual impacts via site selection or screening would be difficult given the character of the landscape along the interface between the WSA and DFPA.

4.9.3.2 Alternative A

Alternative A would consist of drilling 592 wells at 555 locations. Impacts to the recreation resource would be similar to those described for the Proposed Action. However, the increase in the number of well sites, associated roads, production facilities, and management activity would further diminish the sense of isolation and solitude valued by recreationists who visit the area. In addition, the increased number of well sites and related facilities would make it more difficult to find locations where natural screening would minimize impacts particularly where well site density reaches 4 wells per section. Long term impacts would also be substantially higher, due to the additional production wells and associated support facilities that would remain for the 30 to 50 year LOP. Several generations of recreationists could be affected. Adverse impacts to the recreation resource associated with Alternative A would be substantially higher in both the short term and the long term than the Proposed Action.

MVMA and WSA

Impacts to recreation resources in the MVMA would be similar to those described for the Proposed Action.

Impacts to recreation resources in the adjacent WSA could be more adverse than those described for the Proposed Action, a product of the increased number of proposed wells and support facilities.

4.9.3.3 Alternative B - No Action

The No Action Alternative would accommodate previously approved Mulligan Draw and Dripping Rock projects and may allow APD's and ROW actions to be granted by the BLM on a one well per section (Mulligan Draw and Dripping Rock) or a case-by-case basis through individual project and site-specific environmental analysis. Additional natural gas development could occur on State and private lands within the project area under APD's approved by the WOGCC. The potential impact on recreationists would depend on the number of APD's and ROW's granted, their location, and drilling schedule. With the greatly reduced number of wells, the impacts would be similar to, but of lesser magnitude than the Proposed Action.

<u>MVMA and WSA</u>

Impacts to the recreation resource associated with the No Action Alternative would be similar to those described for the Proposed Action but of lesser magnitude.

Impacts to the recreation resource in the adjacent WSA could be similar to those described for the Proposed Action but of lesser magnitude.

4.9.4 Impacts Summary

There would be no significant adverse impact to recreation resources if recommended mitigation measures are employed with the exception of the 23 square miles of project area inside the MVMA and along the 21-mile interface with the WSA. However, some users would be temporarily or permanently displaced and for some that continue to recreate in the area, the experience would be diminished. Several generations of recreationists could be affected.

<u>MVMA and WSA</u>

Drilling and possible production activities of 13 proposed well sites in the DFPA inside the MVMA could have significant adverse impacts to the future recreation potential; impacts would include surface disturbance, changes to general landscape character and visual resources. Future generations of recreationists would be denied the possibility of experiencing isolation and solitude afforded as part of a potential future special management area.

Also, drilling in the MVMA and along the 21-mile DFPA/WSA common boundary could preclude quality recreation opportunities for those seeking solitude and isolation within the northern and eastern portion of the adjacent Adobe Town WSA until all wells have been abandoned and fully reclaimed. This is considered a significant adverse impact. The MVMA is checkerboard land within the project area, the potential consequences as described above could add substantially to the level of adverse impact.

4.9.5 Additional Mitigation Measures

Given the measures proposed by the DFPA Operators (Section 2.5.2.11.2), which would reduce the level of impact; no additional mitigation measures are proposed. There are no additional mitigation measures that would lower the impact below a significant level for drilling activity in the MVMA and along the 21-mile DFPA/WSA common boundary.

4.9.6 Residual Impacts

Given the application of the mitigation measures outlined in Section 2.5.2.11.2 and considering that no additional mitigation measures are proposed, no residual impact discussion is required. Impacts would remain the same as described in Section 4.9.3.

4.10 VISUAL RESOURCES

4.10.1 Introduction

Both short-term and long-term impacts to visual resources could be possible where patterns of area, line, form, color, and texture in the characteristic landscape could be contrasted by drilling equipment, production facilities, and/or construction related damage (e.g., roads, drill sites, pipelines) to vegetation, topography, or other visible site features. The severity of impact depends upon scenic quality, sensitivity level and distance zone of the affected environment, reclamation potential of the landscape disturbed, and the level of disturbance to the visual resource created by the Proposed Action and alternatives. In general, impacts would be most severe on sites where mitigation would be difficult and where visual contrasts would be highly visible to potentially large numbers of viewers.

4.10.2 Impact Significance Criteria

Visual impacts would be considered significant if the following condition were met:

- Non-compliance with the RMP directives in the long term for visual resources (VRM Class 2 and 3).

4.10.3 Direct and Indirect Impacts

4.10.3.1 Proposed Action

The following discussion assumes a non-uniform distribution of wells and support facilities across the landscape with a maximum density of four wells per section in any one location. As noted In Chapter 3, Affected Environment, the DFPA is not pristine, there are 63 existing wells and 259 miles of upgraded and resource access roads. Off road vehicle tracks which exist throughout the area are used occasionally by ranchers, recreationists and mineral developers. However, there are relatively fewer roads within that portion of the project area that is inside the MVMA. Short term impacts to the visual resource include surface disturbance associated with construction and drilling, and construction of new or upgrading of existing roads. Drilling-related impacts would alter existing landscape character producing contrasts in line, form, color, scale and texture. These contrasts would be associated with drilling rigs, construction equipment, service trailers and the general industrial character of drilling activities. Additional impacts may occur from fugitive dust produced by construction activities. The impacts described above would likely occur at various locations throughout the project area for the next 20 years. The affects would be additive, as new areas are being drilled, previously drilled sites, if producing, would be transformed into production status.

Few, if any, drilling sites would be visible from Wyoming Highway 789, the only major paved roadway in the region. However, some drill rig masts may be visible from the Dad area during drilling operations. Potential viewers of the contrasts previously described would be few in number and would include hunters and other recreationists, ranchers, and oil and gas field workers.

In the BLM's VRM rating system, the severity of impact is related to the scenic quality, sensitivity level, and distance zone of the affected environment. In general, short term impacts would be most severe where the level of contrast is high and highly visible in the foreground to potentially large numbers of viewers.

The short term impacts would exceed the level of contrast permitted in both Class 2 and Class 3 areas; however, because the contrasts would be seen by relatively few viewers and would be short in duration in any one area during a drilling season, they would not be considered significant. An exception to this would be the 23 square miles of project area located with the MVMA that is in the VRM Class 2 area.

Fixed facilities such as producing well sites, access roads and compressor stations would remain once well drilling activities were completed. These facilities would create contrasts in line, form, color, texture and overall pattern in the landscape and would remain for the 30 to 50 year duration of the project. Fugitive dust impacts as part of on-going operations would also persist. Levels of contrast would, in general, detract from the visual experience of those recreating in the immediate area. However, as noted for short term impacts, these contrasts would not be visible to many viewers. With appropriate mitigation, the level of contrast would not exceed Class 3 standards and therefore would not be considered significant.

MVMA and WSA

Impacts could exceed Class 2 standard for the 14 BLM administered sections of the project area rated as Class 2 included in the MVMA and could be considered significant depending on well density per section, well location and success of mitigation measures. Drilling in the 14 BLM administered sections within the MVMA would produce contrasts in line, form, color, and texture as previously described. These contrasts would likely persist although at reduced levels after drilling. The impacts in these sections would be considered significant if site disturbances were not reclaimed to VRM levels necessary for the 14 square miles to be considered for inclusion in a potential future ACEC. They could eliminate the opportunity for future generations of recreationists to experience the relatively undisturbed character of visual resources in these 14 sections. In addition, site disturbance and facilities would be visible from other portions of the MVMA and adjacent Adobe Town WSA, diminishing the quality of the visual experience for potential future users of these areas.

It should be noted that 9 square miles within the project area and the MVMA are privately owned. Drilling and potential production could proceed without application of BLM VRM standards or oversight. These activities could, and likely would have significant adverse impacts on the visual resources of adjacent BLM sections and the MVMA in general.

Fourteen public sections in the northwest quadrant of the DFPA are part of the Mulligan Draw Project Area. As precedent, one well per section was permitted in the MVMA (Class 2 VRM) as recorded in the Mulligan Draw ROD (USDI-BLM 1992b). Unregulated drilling activity on private sections could produce significant impacts to the visual resource on public land even if no wells

were drilled on public land. Wells drilled on private land may lead to a need for additional wells on public land to deal with drainage issues.

A visibility analysis was completed for the Monument Valley section of the DFPA. The analysis was done from a 2 track road that runs through T16N, R95W Sections 5-8 and 17 as requested by the BLM. The site is very open, sloping gradually toward the road. There are 4 small 'haystack' formations that produce 3 small triangular-shaped areas that would be seldom seen, two of these areas are on private land. Over 90% of the area would be visible from the 2 track road. Well densities (over 1 per section) in this type of setting would exceed Class 2 VRM standards if the Mulligan Draw Decision is a precedent reference. The generally open nature of the site and its slope toward the road would make it difficult to mitigate visual impacts. However, as noted elsewhere in this section, the number of visitors in this area presently is very low.

4.10.3.2 Alternative A

Impacts associated with Alternative A would be similar to those described for the Proposed Action. The approximately 54 percent increase in the number of potential exploratory well sites, associated roads, production facilities and management activity would further degrade the visual resource by increasing levels of visual contrast. However, impacts would not exceed levels of contrast permitted in Class 3 VRM areas. The increased number of well sites and related facilities would make it more difficult to find locations where natural screening would eliminate them from view. Adverse impacts to the visual resource associated with Alternative A would be substantially higher in both the short term and long term than those of the Proposed Action.

<u>MVMA and WSA</u>

Impacts associated with Alternative A to the visual resources in the MVMA and adjacent WSA would be more adverse than those described for the Proposed Action, a product of the increased number of proposed wells adjacent to the WSA, wells needed to deal with water issues, and support facilities.

4.10.3.3 Alternative B - No Action

No action would accommodate previously approved Mulligan Draw and Dripping Rock projects and may allow APD's and ROW's to be granted by BLM on a case-by-case basis. The potential impact on visual resources would depend on implementation of previously approved projects and the number of APD's and ROW's granted, their location, and drilling schedule. In terms of magnitude, such impacts would likely be considerably less than for the Proposed Action.

<u>MVMA and WSA</u>

Impacts associated with the No Action Alternative (well density/per section) would be the same as those described for the Proposed Action.

4.10.4 Impacts Summary

With the exception of the 23 square miles of project area inside the MVMA, there would be no significant adverse impact to visual resources in the DFPA if recommended mitigation measures are employed. However, some users would be temporarily or permanently displaced and for some

that continue to recreate in the area, the visual experience would be diminished because of dust and a general degradation of visual quality.

MVMA and WSA

Drilling in the 23-square mile MVMA area could preclude high visual quality recreation opportunities for those seeking solitude and isolation within the northwestern portion of the DFPA and adjacent Adobe Town WSA until all wells have been abandoned and fully reclaimed. Several generations of recreationists could be affected. This is considered a significant adverse impact.

4.10.5 Additional Mitigation Measures

With implementation of mitigation measures proposed in Section 2.5.2.11.2 no additional mitigation measures are required.

4.10.6 Residual Impacts

Given the application of the mitigation measures outlined in Section 2.5.2.11.2 and considering that no additional mitigation measures are proposed, no residual impact discussion is required. Impacts would remain the same as described in Section 4.10.3.

4.11 CULTURAL RESOURCES

4.11.1 Introduction

Cultural resources on public lands, including archaeological sites and historic properties, are protected by various laws and regulations, for example the National Historic Preservation Act of 1966 (NHPA) and 36 CFR 800. The specific directives can be found in "Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines" (Federal Register 1983). Laws and regulations concerning cultural resources stipulate the proposed undertaking take into consideration the effects of the action to significant cultural resources. This requires that cultural resources within the proposed area of potential effect (APE) must be identified and evaluated. Measures would be taken to mitigate or minimize adverse effects to historic properties included in, or eligible for, the National Register of Historic Places.

The DFPA data base contains 900 known sites in a 234,880-acre area. Sites include prehistoric open camps consisting of habitation sites, camps with ceramics/pottery, camps with stone circles, camps with cairns, camps identified as milling/processing/ground stone sites, and camps with butchering/processing activity areas. The prehistoric lithic debris sites are categorized as lithic scatters, quarry sites, primary and secondary procurement sites.

The historic sites include the Cherokee Trail, a cabin, a mine, cairns, debris, and ranching/stock herding sites. Prehistoric/historic sites are grouped into prehistoric camps with stone rings and ranching activities, prehistoric camps with historic debris, lithic scatters with historic debris, lithic scatters with ranching/herding material. Of the recorded 900 sites, 24% are recommended eligible for nomination to the NRHP, 20% are recommended not eligible for nomination to the NRHP, and 56% remain unevaluated.

Potential impacts to specific eligible or unevaluated properties are unknown at this time. Only 365 projects have been conducted in the DFPA. The DFPA encompasses approximately 327 square miles or 233,542 acres. Approx.12,263 ac (block) or ca. 5% of the project area have been inventoried at Class III level for an approximate site density of 1 site per 14 acres. The overall site density within the project area varies with the highest number of sites located along drainages and near the major topographic land forms. Ephemeral drainages flow into the Washakie Basin from several escarpments such as Prehistoric Rim, Willow Creek Rim, and Powder Rim, flow into the major drainages of Skull Creek, Sand Creek, Willow Creek Windmill Draw, Shallow Creek, and Barrel Springs Draw along with their tributaries. Certain topographic settings have a higher archaeological sensitivity such as eolian deposits (sand dunes, sand shadows, and sand sheets), alluvial deposits along major drainages, and colluvial deposits along lower slopes of ridges.

4.11.2 Impact Significance Criteria

Mitigation of potential adverse effects is required for National Register listed sites and sites identified as significant and eligible for nomination to the National Register if there is no way to avoid those adverse effects. Significance is measured by four categories defined by the National Register (36 CFR 60.4):

> "the quality of significance in American history, architecture, archaeology, and culture present in districts, sites, buildings, structures and objects of state and local importance that possess integrity of location, design, setting, materials, workmanship, feeling, and association; and that:

- are associated with events that have made a significant contribution to the broad patterns of our history; or
- are associated with the lives of persons significant in our past; or
- embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- have yielded, or may be likely to yield information important in prehistory or history."

For archaeological sites, both prehistoric and historic, significance is primarily judged by the site's ability or potential to yield information important in prehistory or history and how that information will contribute to addressing local and regional questions, topics, and problems. The cultural resources within the DFPA can be evaluated with reference to these research objectives.

The BLM operates under the procedures promulgated under the National Historic Preservation Act (NHPA) at 36 C.F.R. 800 and/or the national programmatic agreement and statewide protocol to assess effects to sites deemed eligible for nomination to the National Register. Significant adverse effects to cultural resources may include:

- Destruction or alteration of all or part of a property.
- Isolation of a cultural resource from, or alteration of, its surrounding environment.

- Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting.

- Neglect and subsequent deterioration.

The preferred strategy of cultural resource management is avoidance of cultural properties identified as significant and the redesign, relocation, or cancellation of projects that pose adverse effects to significant cultural resources. If this strategy cannot be implemented, mitigation will ensue.

4.11.3 Direct and Indirect Impacts

4.11.3.1 Proposed Action

Adverse effects could be in the form of direct, indirect, or cumulative impacts. Direct impacts would primarily result from construction related activities and would be considered significant if lost information impeded efforts to reconstruct the prehistory or history of the region. Activities considered to have the greatest effect on cultural resources include blading of well pads and associated facilities, and the construction of roads and pipelines. Alteration of the environment abutting eligible historic properties (recommended under Criteria a, b, or c) may be considered an adverse effect in the form of a direct impact. Sites located outside the APE would not be directly affected by the construction activities. If the area of the site crossed by earth disturbing activities does not possess the qualities that contribute to the eligibility of the site, the project is judged to have no effect. Appropriate avoidance and other mitigation measures would be implemented to minimize the potential loss of information due to any adverse effects.

Indirect impacts would not immediately result in the physical alteration of the property. Indirect impacts to prehistoric sites primarily would result from unauthorized surface collecting of artifacts which could physically alter the sites. At historic sites this could include bottle collecting and the introduction of visual impacts.

Contributing segments of historic trails would be avoided by a ¼ mile buffer zone or within the visual horizon, whichever is closer. These actions are designed to provide protection for the historic trail corridors.

4.11.3.2 Alternative A

Potential impacts to prehistoric and historic properties under Alternative A would be similar to the Proposed Action but of a greater magnitude due to potentially more site disturbance. These impacts are expected to increase on private surfaces under this alternative.

4.11.3.3 Alternative B - No Action

Under the No Action Alternative, the Proposed Action would not be implemented and further drilling would be allowed on federal lands to the extent that it would be within the scope of existing environmental analyses (i.e. Mulligan Draw and Dripping Rock decisions) and individual APD's that would be approved on a case-by-case basis. In terms of magnitude, such impacts would likely be considerably less than for the Proposed Action.

4.11.4 Impacts Summary

Gauging the effect of any impact depends on the level of information available for that particular property provided by inventory and/or testing data. If cultural resources on, or eligible to, the National Register are to be adversely impacted by the proposed undertaking, then the applicant, in consultation with the surface managing agency and the SHPO, shall develop a mitigation plan. Construction would not proceed until terms of the mitigation plan are satisfied.

4.11.5 Additional Mitigation Measures

With implementation of mitigation measures proposed in Section 2.5.2.11.2 (Cultural Resources), no additional mitigation measures are needed.

4.11.6 Residual Impacts

Given the application of the mitigation measures outlined in Section 2.5.2.11.2 and considering that no additional mitigation measures are proposed, no residual impact discussion is required. Impacts would remain the same as described in Section 4.11.3.

4.12 SOCIOECONOMICS

4.12.1 Introduction

Implementation of the two action alternatives would result in socioeconomic effects including: (1) increased employment and activity in the local, regional and national economy; (2) additional tax revenue for federal, state, and local governments; and (3) incremental demand for housing and public services in small communities and unincorporated areas near the DFPA. Both action alternatives also have the potential to affect attitudes and opinions regarding the use of public lands and to create dissatisfaction for some hunters, recreationists and other individuals and organizations who believe that public lands within the MVMA should be left in their relatively undisturbed state.

Many of the socioeconomic effects associated with the action alternatives could also occur under Alternative B (No Action), because previously approved wells and wells approved on a case-by-case basis would be developed. As with the action alternatives, the magnitude of the impacts would depend on the pace and level of development that actually occurs.

Development of the natural gas resources within the DFPA would involve multiple operators. The pace and timing of drilling and field development would depend on a variety of factors including national and international energy demand and resultant commodity prices, actual production experience within the DFPA and each company's development initiatives and strategies. Because the pace and timing of development cannot be predicted with certainty, this assessment assumes a relatively constant rate of development, based on the drilling of an annual average number of wells (i.e., total number of wells proposed divided by the 20-year development cycle).

Historically, drilling and field development in southwest Wyoming has been cyclic rather than constant. Moderate cyclic increases and decreases in drilling and field development activity would not result in impacts substantially different from those identified in this section. However, a

substantial and sustained increase in natural gas demand and price, resulting from unforseen circumstances (e.g., world events, changes in national energy policy or sustained high economic growth), could result in a dramatic increase in the pace of development and impacts greater than those identified in this section. Such circumstances would affect development of natural gas resources throughout southwest Wyoming and are discussed in the cumulative socioeconomic assessment contained in Section 5.3.12.

4.12.2 Impact Significance Criteria

The following criteria are used to determine whether socioeconomic impacts of the Proposed Action and alternatives would be significant:

- an increase in county or community population that would strain the ability of affected communities to provide housing and services or otherwise adapt to growth-related social and economic changes;

- an aggregate change in revenue and expenditure flows likely to result in an inability on the part of affected units of government to maintain public services and facilities at established service levels;

- permanent displacement of residents or users of affected areas that would result from project-induced changes in or conflicts with existing ways of life;

- levels of project-induced dissatisfaction likely to generate organizational response and conflict.

4.12.3 Direct and Indirect Impacts

4.12.3.1 Proposed Action

4.12.3.1.1 Economic Effects

The Proposed Action, as described in Chapter 2 of this assessment, would involve an estimated $840 million capital investment for drilling, completion, gathering systems and field infrastructure. This investment would occur over 20 years.

Development and operation of the Proposed Action would require goods and services from a variety of local and regional contractors and vendors in the oil and gas service industry and other industrial sectors. Expenditures by the proponents for these goods and services, coupled with employee and contractor spending, would generate positive economic effects in southwestern Wyoming, the State of Wyoming and the nation as a whole.

The University of Wyoming Agricultural Economics Department has developed an input-output economic model specifically for southwest Wyoming. The model maps the flow of dollars through the region's economy and provides information about the interaction of individual sectors within the regional economy. The model considers both the direct effects on the producing sector(s) of a change in economic activity and the secondary effects on other local sectors due to the linkages within the region's economy. The model was used for the socioeconomic portion of the BLM's Southwest Wyoming Resource Evaluation (UW 1997) and has been updated for the Desolation Flats assessment.

The model and other elements of this assessment are based on the following assumptions:

- Drilling and field development in the DFPA would occur over 20 years, during which 385 wells would be drilled with a success ratio of 65 percent, yielding 250 producing wells.

- An average of 19 wells would be drilled each year and an average of 12.5 of these would be productive; the average life-of-well production would total as much as 5BCF;

- Each well would require an average of $1.5 million to drill and an additional $1.05 million to complete.

- Revenues and expenditures are expressed in terms of constant 2001 dollars, except for annual average well head gas prices, which are based on the most recent US Department of Energy forecasts ($2.79/MCF in 2002, falling to $2.49/MMCF by 2004 increasing thereafter to $4.53 by 2041) (DOE 2000). DOE estimates are in 1999 dollars, which were converted to deflated 2002 dollars for use in the UW model.

Use of the foregoing assumptions and the UW model allow a reasonable assessment of the potential socioeconomic impacts of the Proposed Action and alternatives, however, economic effects of the Proposed Action would be different than those forecast by the model if actual conditions vary substantially from these assumptions.

Estimated economic effects of drilling and field development are displayed in Table 4-19 Based on the foregoing assumptions, the UW model estimates that an annual average direct expenditure of about $40 million would result in an annual economic impact (direct and indirect) of about $54.5 million in southwest Wyoming, or a total economic impact of $1.145 billion over the 20-year drilling cycle. Note that the Proposed Action contains a 20-year elapsed-time drilling schedule, but completion and field development activities are assumed to occur in portions of 21 calendar years.

The model also estimates that annual drilling and field development earnings in southwest Wyoming would be $7.3 million or about $154 million total over 20 years. These earnings would support an average of 246 annual job equivalents (AJE).

Table 4-19. Estimated Economic Effects Associated with Drilling and Field Development: Proposed Action

	Direct Expenditures	Total Economic Impact	Total Earnings	Employment (AJE, direct & indirect)
Average Annual	$40 million	$54.5 million	$7.3 million	246
Total	$840 million	$1.145 billion	$154 million	n/a

Source: UW 2001

Job estimates include direct and indirect; AJE denotes annual job equivalents.

Estimated economic effects associated with production are presented in Table 4-20 The life of the Proposed Action is projected to be 30 to 50 years. For the socioeconomic assessment, a 40 year production cycle is assumed. Based on the assumptions outlined in the earlier part of this assessment, natural gas and condensate production would result in over $2.97 billion in economic impact over the 40 year production cycle, and in an average annual payroll of $5.5 million supporting156 annual average job equivalents. Production-related jobs (direct and indirect) begin at an estimated 36 in 2003, increase to 90 in 2004 and then steadily increase to a peak of 280 in 2022, at which point they begin to decrease. Production-related jobs would be distributed throughout southwest Wyoming.

Table 4-20. Estimated Economic Effects Associated with Production

	Value of Production	Total Economic Impact	Total Earnings	Employment (AJE, direct & indirect)
Average Annual	$56.6 million	$74.4 million	$5.5 million	156
Total	$2.265 billion	$2.977 billion	$218.4 million	n/a

Source: UW 2001

As shown in Table 4-21, the combined drilling, field development and production phases of the project would generate an estimated $4.122 billion in total economic impact to southwest Wyoming, including $372 million in total payroll over the 40 year LOP used for this assessment.

Table 4-21. Estimated Total Economic Impact: Drilling, Field Development and Production

	Total Economic Impact	Total Earnings
Total	$4.122 billion	$372 million

Source: UW 2001

Implementation of the Proposed Action would substantially increase natural gas production in Sweetwater and Carbon counties. Under the assumptions used for this assessment, annual gas production would total 16 million MCF in 2004, increase to 50.5 million MCF in 2022, and then gradually decrease to about 10 million MCF in 2042 (Figure 4-9). By comparison, Sweetwater and Carbon County natural gas production in 1999 totaled 224 million MCF and 80 million MCF respectively. At the volumes assumed for this assessment, over 1.1 trillion cubic feet of natural gas would be produced over the 40 year production cycle.

Additionally, each Desolation Flats well is estimated to produce an annual average of 1,000 barrels of condensate. Condensate volumes are projected to increase from a 2004 total of about 32,600 barrels to a peak of about 101,000 barrels in 2022 and decrease to about 21,000 barrels in 2042. Over the 40 years, condensate volumes would total an estimated 2.26 million barrels.

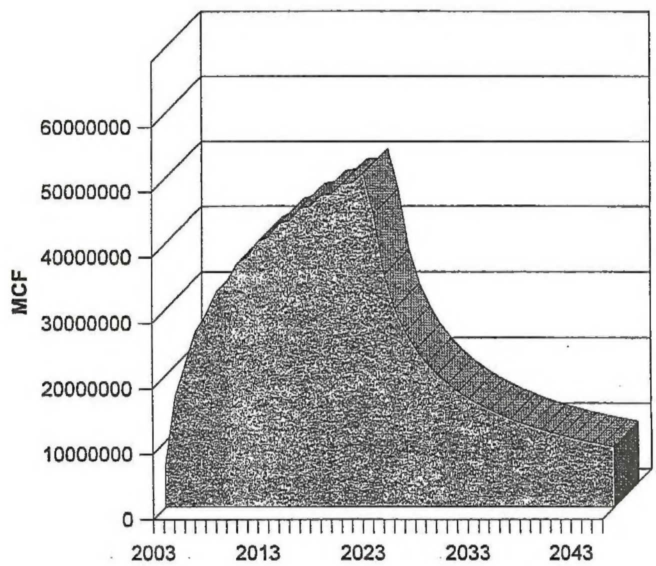
In 1999, APD's (drilling permits) issued for Sweetwater and Carbon counties totaled 123 and 127, respectively. The average annual level of 19 wells assumed for the Proposed Action would equal about 8 percent of the combined two-county total for 1999.

4.12.3.1.2 Effects on other Economic Activities in the Vicinity of the Proposed Action

As outlined in Section 3.11, existing land uses in the vicinity of the Proposed Action include wildlife habitat, grazing, hunting and other dispersed recreation, and oil and gas exploration, production and transmission.

Potential impacts to grazing activities and range resources are discussed in Section 4.6. Economic effects of the Proposed Action on grazing activities would include losses of forage due to temporary and long-term disturbance. As described in Section 4.6.1, disturbance would result in the loss of an average annual of 170 AUM's or a total of 6,796 AUM's over the 40 year assessment period.

Figure 4-9. Proposed Action: Estimated Total Annual Gas Production: 2002 - 2045



Source: UW 2001; Marathon Oil Company 2000

If these AUM's are not replaced in other allotments, the associated economic activity in Sweetwater and Carbon counties would also be lost. A recent UW study estimated that each AUM of cattle grazing was worth $65.07 in total economic impact in the region, and resulted in $11.81 in earnings and .000710 jobs. Each AUM of sheep grazing was worth $41.16 in regional economic impact, $8.99 in earnings and generated .000639 jobs (UW 2000). Using the higher figures for cattle, implementation of the Proposed Action would result in a loss of $442,000 in total economic activity and $80,000 in total earnings over the 40 year LOP. The proposed action would also result in loss of an annual average of 0.1 jobs. Changes in livestock commodity prices would yield different loss estimates.

According to the recreation assessment contained in Section 4.9, some hunters and other recreationists may be temporarily displaced from the area by drilling and field development activity and land disturbance. A lesser number of hunters and recreationists may be displaced long-term because of the loss of undisturbed landscapes and solitude. The above-referenced UW report provided estimates of per/day total regional economic impacts from recreation, which range from

a high of $331 per day for elk and antelope hunting to a low of $81 per day for non-consumptive recreation uses. For these same activities, regional earnings associated with various recreation activities range from $47 per day for elk hunting to $13 per day for non-consumptive recreation, and regional jobs range from .003 for elk and antelope hunting to .001 per day for non-consumptive recreation. In addition to these expenditure-related economic effects, the UW study estimated economic benefits to individual recreational participants, known as net economic value. The net economic values of hunting were estimated at $41.46 per day and $26.57 per day for non-consumptive recreation uses (UW undated).

Estimates of the number of recreationists who use the DFPA are not available. Estimates of the number of hunters and other recreationists who would be displaced temporarily or long term by the Proposed Action are similarly not available. Some new recreationists may be attracted to the area by the increased accessibility resulting from road construction (USDI-BLM 1999a); estimates of potential new users are also not available. Since overall recreational use levels in the DFPA are generally low, the economic effects of displaced hunters and recreationists on the Sweetwater and Carbon county economies would be correspondingly low. There is also some potential that displaced hunters and recreationists may relocate to other areas within southwest Wyoming offsetting a portion of the loss of economic activity, although opportunities for relocating to relatively undisturbed areas are becoming increasingly limited.

4.12.3.1.3 Employment and Population Effects

Population effects of the Proposed Action would be linked to both direct and indirect employment. Direct jobs are defined as jobs in the oil and gas service or construction sectors involving work on some aspect of the project. Indirect jobs are created by company and employee spending for goods and services, and would occur in all economic sectors. As a result of the Proposed Action, both direct and indirect jobs would be created throughout southwest Wyoming, but concentrated in Rock Springs, which has emerged as a regional oil and gas service center.

The average annual 246 drilling and field development and 156 production-related jobs (direct and indirect) estimated by the UW model are AJE. AJE jobs reflect an aggregation of all employees whose employment is supported in part by Desolation Flats project spending.

The distinction between AJE jobs and the number of employees who may work occasionally on Desolation Flats project activities is useful in the assessment of potential population impacts associated with the Proposed Action, and to the determination of the distribution of that population. For example, an estimated 103 AJE or 42 percent of the total 246 drilling and field development employment associated with the Proposed Action would be in oil and gas field services. Drilling and completing a natural gas well involves a number of distinct activities that are carried out by specialized contractors who are on site for a variable amount of time. Some contractors such as surveyors and archeologists are on site for a day or less per well, others such as mud loggers, engineers and vendors are on site once a week or every several days throughout the drilling cycle. Still others such as drill crews may be on site every day for 50 or 60 days, depending on the length of time it requires to reach the drilling target. Vendors, BLM and other regulatory personnel, truck drivers and delivery persons visit wells briefly. They are included in the AJE estimates presented above, but are not included in the drilling employment estimates shown in Figure 4-10.

In a multiple operator situation such as the Proposed Action, an oil and gas service firm employee may work for several days on a Desolation Flats well and then relocate to a well in a different part

of the region. Although many workers would perform work in the DFPA, few would work there full-time for extended periods.

An employee of an oil and gas service company is likely to live near his or her employer. Because the greatest number of oil and gas service firms are located in Rock Springs, the employee is most likely to live in the Rock Springs area. Fewer numbers of employees would live in Rawlins, given the smaller number of oil and gas service firms located there. Even fewer employees would be likely to establish long-term residences in Wamsutter or the Baggs area, even though the DFPA is located nearer to these communities.

However, some contractor employees would seek temporary housing (motels and RV park spaces) in nearby communities during the time they are working in the DFPA. Consequently, it is useful to estimate the numbers of workers who might be working in the DFPA, both on a monthly average and peak daily basis.

Because multiple operators hold leases in the DFPA, well drilling schedules within any given year cannot be predicted. Simulations of daily employment for each well and of a 19 well drilling schedule were used to provide estimates of monthly wellfield employment levels over the course of a year.

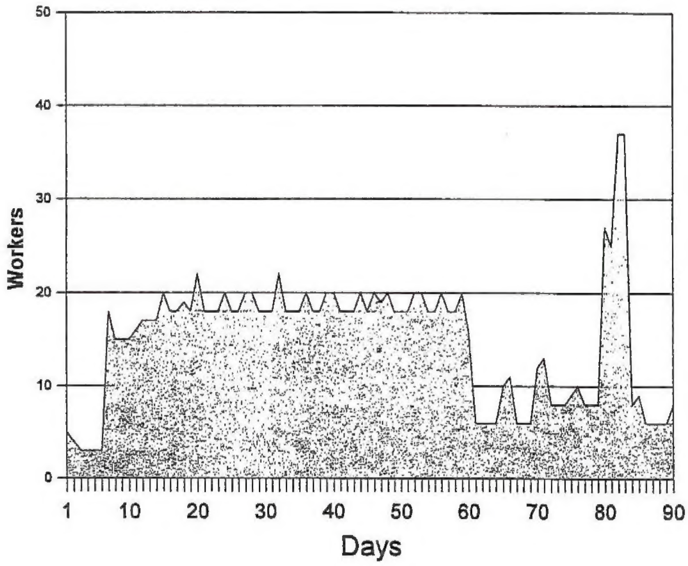
Figure 4-10 displays simulated drilling and completion employment levels associated with a typical DFPA well. Based on this simulation, employment would average 15 workers during the first month of drilling, 19 during the second month and 11 during the third month or completion phase for successful wells. Peak employment days during these months are estimated at 22, 22 and 37 workers respectively, under the assumptions used for this simulation. Events and circumstances could make both averages and peaks somewhat higher or lower than those used in this simulation. Simultaneous drilling of two or more wells by any one company would result in slight workforce reductions because certain contractors and company personnel could perform tasks on several wells during the course of a day.

Figure 4-11 displays a simulation of the monthly drilling and completion employment in the project area during a year, assuming an average number of 19 wells per year. Based on this simulation, drilling employment would peak in August at a monthly average of 131 workers. Daily averages during August and September could peak as high as 194 workers if peak days at several wells were to coincide. Drilling is assumed to diminish from mid-November through the end of July in areas where there are wildlife concerns. In some portions of the DFPA, drilling could diminish or even cease during March through June because of muddy conditions.

Four compressor stations are assumed to be constructed under the Proposed Action. Total employment during periods when compressor stations are constructed would be increased by an estimated 12 workers for an estimated 7 days. Similarly, one processing plant is assumed for the Proposed Action. During the period when the processing plant is constructed, total employment would be increased by 24 workers for an estimated 21 days.

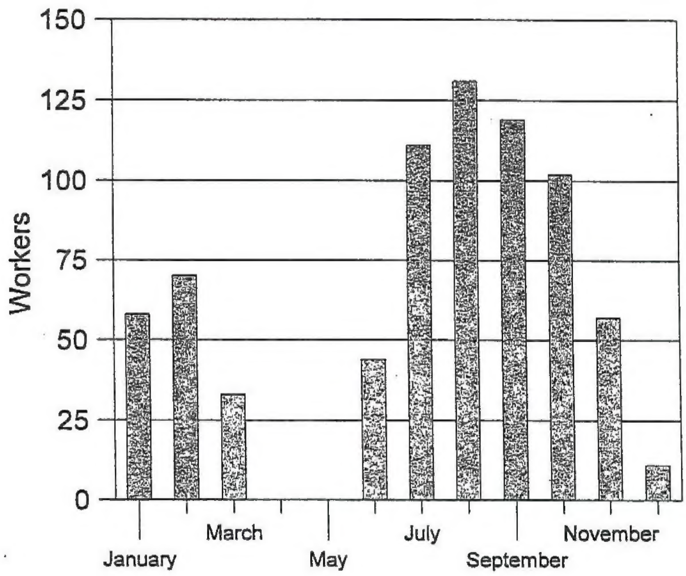
Once wells are drilled, completed and placed in service, it is estimated that wellfield operations would require less than 20 workers, although workovers and other maintenance activities would require additional contractors on an intermittent basis. An estimated three workers would require seven days to reclaim each well site and access roads if wells are unsuccessful or when gas reservoirs are depleted and wells are taken out of service.

Figure 4-10. Simulated Daily Drilling and Completion Employment: (One Well)



Source: Marathon Oil Company, 2000

Figure 4-11. Simulated Monthly Average Drilling and Completion Employment (19 Wells/Year)



Source: Blankenship Consulting LLC

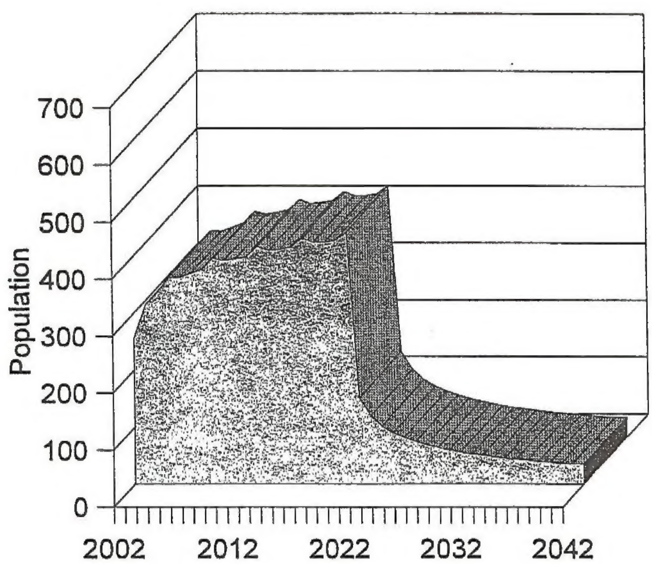
Some of the jobs created by the Proposed Action may be filled by existing residents of southwest Wyoming, resulting in no incremental population growth. Other jobs may be filled by persons who live outside southwest Wyoming at the time they are hired. A portion of this latter group would relocate to southwest Wyoming in a single status, others may bring their families.

It is likely that most direct jobs associated with the Proposed Action would be filled by non-local workers. A consequence of the recent increase in natural gas drilling activity throughout the state and elsewhere in the nation is that demand for skilled oil and gas service workers exceeds the current supply. Recent southwest Wyoming NEPA assessments have assumed that 50 to 55 percent of direct workers would be non-local. For this assessment, it is assumed that 80 percent of all oil and gas services jobs would be filled by workers outside the area.

Conversely, it is likely that most indirect jobs would be filled by local workers. As discussed in Section 3.11, a recent report identified 4,900 underemployed workers in Sweetwater and Carbon counties. These workers would be candidates for indirect jobs. Jobs vacated by underemployed workers would likely be filled in large part by unemployed workers and existing residents not currently in the workforce. Consequently, this assessment assumes that 90 percent of the non-oil and gas services jobs associated with the Proposed Action would be filled by workers currently living in southwest Wyoming.

Based on these assumptions, it is estimated that the in-migrant population associated with Proposed Action would total 255 persons in 2003, increasing annually to a peak of 442 in 2022 and decreasing steadily thereafter. Figure 4-12 displays Proposed Action-related in-migrant population estimates over the life of the project. The figure illustrates the substantial reduction in Proposed Action-related population which would occur at the end of the 20-year drilling and field development cycle. This population may leave or stay in southwest Wyoming, depending in large part on economic conditions and job opportunities at that time.

Figure 4-12. Estimated In-migrant Population Associated with the Proposed Action



Source: Blankenship Consulting LLC based on UW employment estimates.

Current population projections available from the Wyoming Division of Economic Analysis show slight population losses over the next six years for both Sweetwater and Carbon counties. In the absence of other development, the population increases associated with the Proposed Action may reduce near-term population losses in both counties.

The population associated with the Proposed-Action would be distributed throughout southwest Wyoming, but concentrated in Rock Springs and to a lesser extent, Rawlins. A relatively small number of oil and gas service firms are located in Wamsutter and Baggs; these companies may hire non-local workers if they obtain contracts for work in the DFPA.

4.12.3.1.4 Housing Demand

The Proposed Action would create demand for long term housing (houses, apartments and mobile homes and spaces in mobile home parks). Based on the assumptions used for this assessment, long term housing demand associated with the Proposed Action would total about 100 units in 2003, increasing to a peak of about 160 units over the next ten years. This demand could be accommodated in Rock Springs and Rawlins with existing housing resources. The Wamsutter and Baggs areas could also accommodate a small portion of this workforce with existing housing resources, although DFPA workers would have to compete with other oil and gas industry workers for the limited housing resources in these communities.

The Proposed Action would also generate demand for temporary housing. A portion of the project drilling, completion and field development workforce would return to a place of residence each night, and some drilling contractors may elect to establish temporary work camps at the drill site.

Other drilling and completion crews would be in the area for one or two months and would seek temporary housing. Although these workers would prefer to secure temporary housing (primarily apartments, motel rooms or mobile home and recreational vehicle park spaces) as close to the DFPA as possible, they would be competing for these limited resources with other area oil and gas workers, at least in the near term. Consequently, most would be required to travel to Rock Springs, Rawlins or the Colorado community of Craig to secure temporary housing accommodations. At present, these communities have adequate temporary housing resources to accommodate Proposed Action-related demand.

4.12.3.1.5 Community Facilities, Law Enforcement and Emergency Management Services

The relatively small incremental population associated with the Proposed Action would not strain most community facilities in Sweetwater or Carbon counties or the communities of Rock Springs or Rawlins. Population levels in these counties and communities remain substantially below the peak levels of the 1980's. Most public facilities have been sized to accommodate larger populations and would be able to accommodate this relatively small population increment, although there are exceptions. For example, both Sweetwater and Carbon counties are planning to replace currently inadequate jail facilities, for capacity and programmatic reasons. Additionally, any population increment could contribute to the need for additional county, municipal and school district staff and equipment in areas that are experiencing natural gas-related growth, such as Wamsutter and Baggs. In the case of the counties, the Proposed Action would generate substantial tax revenues (see Section 4.12.3.1.6.3) which could be used to fund demand for additional staff and equipment.

The situation is different for the towns of Wamsutter and Baggs. Public services in Wamsutter are already strained as a result of large drilling programs in the area, and the town is currently preparing a plan to increase housing and expand its public facilities (Rawlins Daily Times 2001). In the near term, few project workers would be able to find housing in Wamsutter. If additional housing is developed, the Proposed Action, along with the general increase in drilling and field development activity in the area (see Section 5.12), would contribute to increased demand for expanded public services in the Town. Unlike the larger communities, which receive substantial sales and use tax, and counties, which also receive property taxes, smaller towns receive little direct tax revenue from natural gas development.

Currently, the Town of Baggs is able to accommodate the seasonal influx of workers which fills its temporary housing resources. If additional housing resources are developed, or if a substantial number of oil and gas service contractors and their employees were to relocate to the area on a long term basis, some community facilities could be strained. As with Wamsutter, the Town of Baggs would receive little direct tax revenue from the Proposed Action.

Law enforcement and emergency management services in the DFPA are provided by Sweetwater and Carbon county sheriff's officers and by volunteer fire and ambulance organizations located in Wamsutter or Baggs. Taken in isolation, the level of development contemplated by the Proposed Action could be accommodated by existing law enforcement and emergency management resources. However, given the anticipated near-term increase in drilling and field development in the area, law enforcement and emergency service agencies may need to expand their capabilities to provide adequate coverage in areas experiencing natural gas development (Section 5.12). Sweetwater and Carbon county governments would receive substantial project-related tax revenues which could be used to help fund increases in law enforcement and emergency management services, although project-generated revenues may lag project-related demand for services.

Wellfield traffic in and near the project area would result in increased demand for maintenance on county roads. Proposed Action-related traffic would contribute to the already substantial maintenance requirements on the Wamsutter/Dad Road (SCR 23/CCR 701) and to maintenance needs on CCR 700. Project-related ad valorem and sales and use tax revenues generated to the counties should be adequate to fund increased maintenance requirements, unless substantial project-related road maintenance demand occurs before production-related revenues begin to accrue to the counties.

4.12.3.1.6 Fiscal Effects

The Proposed Action would generate substantial tax revenues including:

- local ad valorem property taxes on production and certain field facilities;
- sales and uses taxes on materials, supplies and equipment;
- Federal Mineral Royalty payments; and,
- Wyoming State severance taxes.

4.12.3.1.6.1 Ad Valorem Property Taxes

The Proposed Action would generate ad valorem property tax to Sweetwater and Carbon counties, the Wyoming School Foundation Fund, school districts and a number of special taxing districts within each county. Ad valorem property taxes would be generated from two sources: (1) the fair

market value of natural gas and condensate produced and sold; and (2) the value of certain wellfield and production facilities (underground facilities associated with wells are exempt).

Constant 2000 mill levies were used to prepare ad valorem property tax estimates. In reality mill levies are set each year by the county commissioners and officials of the various taxing districts; most change each year. Mill levies reflect the revenue needs of the taxing entity and estimates of assessed valuation within the entity. Natural gas is assessed based on the previous year's production. Wellfield facilities are depreciated after the first year of production.

Table 4-22. Displays estimated ad valorem property tax revenues to major property taxing entities in each county.

Under the assumptions used for this assessment, ad valorem property tax revenues from production and facilities would total almost $139 million over the 40 year life of the project.

4.12.3.1.6.2 Federal Mineral Royalties and Wyoming Severance Taxes

The federal government collects a 12.5 percent royalty on the fair market value of gas produced from federal leases, less production and transportation costs. Half of mineral royalty revenues are returned to the state where the minerals were produced. In Wyoming, a portion of the state's share is distributed to local governments and to the Wyoming School Foundation Fund.

The State of Wyoming collects a six percent severance tax on the fair market value of natural gas produced within the state. Federal mineral royalty payments and production and transportation costs are exempt from this tax. The state distributes revenues from this fund to a variety of accounts including the General Fund, Water Development Fund, Mineral Trust Fund, and Budget Reserve, and distributes a portion (one percent) to counties and municipalities.

Table 4-22. Total Estimated Ad Valorem Property Tax Revenues

Sweetwater County	School District U-1	State & Cty Schools	Total County	Weed & Pest	Communit y College	Total
Total (40 year)	$51,014,000	$36,010,000	$24,007,000	$852,000	$11,325,000	$123,208,000
Average Annual	$1,275,000	$900,000	$600,000	$21,000	$283,000	$3,080,000
Carbon County	School District U-1	State & Cty Schools	BOCES	Total County	Weed & Pest	Total
Total (40 year)	$6,820,000	$4,910,000	$273,000	$3,274,000	$273,000	$15,550,000
Average Annual	$170,000	$123,000	$7,000	$82,000	$7,000	$389,000

Note: Table does not breakout all special districts.
Source: Blankenship Consulting LLC

Estimated mineral royalty and severance tax revenues are displayed in Table 4-23. Actual mineral royalty and severance tax revenues would vary based on production levels, gas sales prices, and production and transportation costs. Actual severance tax revenues may be less than these estimates if a portion of the gas is used for production purposes. Actual federal mineral royalty collections may be less if a substantial portion of the production is drawn from state leases.

Table 4-23. Federal Mineral Royalty and Wyoming Severance Tax Estimates

	40 Year Total	Average Annual
Federal Mineral Royalties	$283,259,000	$7,081,000
Wyoming Share of Federal Mineral Royalties	$141,629,000	$3,541,000
Wyoming Severance Taxes	$118,969,000	$2,974,000

Source: Blankenship Consulting LLC

4.12.3.1.6.3 Sales and Use Tax

Wyoming collects a four percent sales and use tax on the gross receipts of sales of tangible goods and certain services (drilling services are exempt). The state returns 28 percent of the revenue (less administrative costs) to the county where the taxes were collected. Counties distribute the revenues to incorporated municipalities based on population. Both Sweetwater and Carbon counties also levy a one percent local optional sales and use tax which is distributed to the county and its municipalities. Carbon County recently retired an additional one percent capital facilities sales and use tax. The County may ask voters to approve the capital facilities tax again in 2003. If approved, the Carbon County sales and use tax rate would increase to six percent and additional project-related revenues would flow to the counties and incorporated municipalities.

During the drilling and completion phase of the Proposed Action, an estimated $185 million would be spent for goods and services subject to state and local sales and use taxes. Table 4-24 displays the state and local revenues which would flow from these expenditures, assuming that all sales and use tax payments are appropriately credited to Sweetwater and Carbon counties. Total sales and use tax revenues over the 20-year drilling cycle would be $9.3 million dollars. Of the total, an estimated $ 5.3 million would be distributed to the State of Wyoming, $3.45 million to Sweetwater County and $471 thousand to Carbon County.

4.12.3.1.6.4 Total Revenues

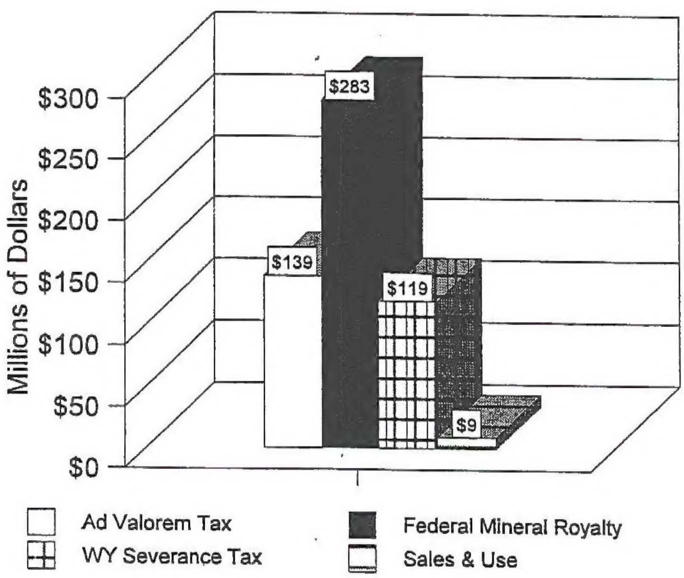
Figure 4-13 summarizes the estimates of tax and royalty revenues which would flow from the Proposed Action from the foregoing sources. The revenues are based on production, gas sales prices, tax rates and exemption estimates, all of which are subject to change as development proceeds. In addition to these revenues, other revenues would be associated with the Proposed Action including sales and use tax payments for ongoing operations of the project and from employee and vendor spending, Oil and Gas Conservation charges, and federal income tax payments by the proponent and its employees. These revenues have not been estimated for this assessment.

Table 4-24. Estimated Sales and Use Tax Revenues and Distributions

	State of Wyoming					
Total	$5,338,000					
Average Annual	$254,000					
	Sweetwater County Total	County Share	Rock Springs	Green River	Wamsutter	All Other Towns
Total	$3,458,000	$584,000	$1,720,000	$1,085,000	$24,000	$45,000
Average Annual	$165,000	$28,000	$82,000	$52,000	$1,000	$2,000
	Carbon County Total	County Share	Rawlins	Baggs	Dixon	All Other Towns
Total	$471,000	$81,000	$257,000	$10,000	$2,000	$120,000
Average Annual	$22,000	$4,000	$12,000	$500	$100	$6,000

Source: Blankenship Consulting LLC

Figure 4-13. Total Ad Valorem Property Tax, Federal Mineral Royalty, Severance Tax and Sales and Use Tax Revenues Associated with the Proposed Action



Source: Blankenship Consulting LLC

Federal, state and local government revenues from these sources would total an estimated $550 million over the forty-year life of the project.

4.12.3.1.7 Local Attitudes and Opinions

Sweetwater and Carbon counties have relatively long histories of oil and gas development, consequently residents are familiar with natural gas industry activities and their economic benefits. The combination of familiarity and anticipated economic benefit creates a climate of general community acceptance of and support for continued oil and gas development in Sweetwater and Carbon counties. Within this general climate of acceptance are resident attitudes and values that may diminish support or create opposition for a particular development proposal. These attitudes and values include concern for use of public lands and preservation of wildlife habitat and recreation resources.

These attitudes and values are evident in a number of the comments submitted in response to the DF scoping notice. Additionally, a discussion of these attitudes and values, as expressed by Carbon County residents, is included in the findings of the 1996 resident survey conducted for the Carbon County Land Use Plan (discussed in Section 3.12.7).

According to the Carbon County Land Use Plan, resident response to the survey suggests "a need to balance the conservation of natural resources and the economic viability of resource-based industries in the county." This sentiment coupled with partial support for leasing more federal lands for oil and gas development (about 50 percent countywide, somewhat higher in every community but Rawlins and Saratoga) suggests that development of natural gas resources on existing leases would be generally supported by residents of Carbon County, as long as they perceive that such development does not damage wildlife habitat, or degrade the quality of recreation resources in the area.

Although no similar survey has been conducted for Sweetwater County (Kot 2000), it is reasonable to assume that some Sweetwater County residents hold similar attitudes concerning oil and gas development, recreational resources and wildlife habitat, although the numbers of residents holding each view in Sweetwater County may vary from those in Carbon County.

The recreation analysis conducted for this assessment concludes that implementation of the Proposed Action would result in substantial impacts to the recreation resource, but the impacts would not be considered significant due to the short term nature of drilling and construction activities (at any one well location), the sequential pattern of drilling activities during any one drilling season and the small number of recreationists affected in the long term (Section 4.9.4). An exception to this conclusion concerns the portion of the DFPA which lies within the MVMA, and the potential that the relatively unaltered landscape and opportunities for isolation and solitude in this area would be foregone over the long term.

Based on these conclusions, it is likely that the Proposed Action would receive general support in Sweetwater and Carbon counties, but some population segments would experience negative effects. Population segments who would be dissatisfied with the Proposed Action include those hunters and other recreationists who use the DFPA and feel that the hunting or recreation experience would be diminished by changes in game patterns or changes in the undisturbed landscapes, isolation and solitude. Individuals and organizations who believe that the relatively

undisturbed landscapes within the MVMA should be left in their current condition would also be dissatisfied.

Livestock operators who hold permits within the DFPA may also experience dissatisfaction with the Proposed Action if conflicts between grazing and drilling and field development activities arise. Opportunities for conflict would be substantially reduced once drilling and field development is completed.

It is also possible that broader levels of dissatisfaction with the Proposed Action could occur if area residents perceive that impacts to wildlife habitat or recreation resources are greater than anticipated.

4.12.3.2 Alternative A

Alternative A would involve the drilling of 592 wells at 555 locations, a 54 percent increase over the number of wells in the Proposed Action. For the Alternative A assessment, all other assumptions (20-year drilling schedule, 65 percent success ratio, production volumes, LOP, product prices, etc.) remain the same as those used for the Proposed Action. Consequently, economic, population and fiscal effects of Alternative A would all be roughly 54 percent higher than those associated with the Proposed Action.

During the drilling cycle, an annual average of 28.2 wells would be drilled, and 18.3 would be completed. Total direct expenditures for drilling and completion would increase to an estimated $1.292 billion, or an average annual expenditure of $61.5 million. These expenditures would create an estimated total economic impact of $1.762 billion in southwest Wyoming, with an average annual impact of $83.9 million over the 20-year drilling cycle. Alternative A would result in an estimated total $236 million in earnings, or an annual average of $11.2 million, which would support annual average direct and indirect employment of 378 AJE.

The economic effects of Alternative A-related production would include an estimated $3.487 billion dollars in total production, which would generate a total economic impact of $4.584 billion in southwest Wyoming, or an annual average of $114.6 million over the 40 year production cycle. Total production-related earnings are estimated at $336 million, or an average annual of $8.4 million which would support annual average direct and indirect employment of 241 AJE.

Combined economic effects of drilling and production are presented in Table 4-25.

Table 4-25. Alternative A: Combined Economic Effects, Drilling and Production

	Total Economic Impact	Total Earnings	Employment (Direct & Indirect AJE)
Drilling & Completion	$1.762 billion	$236 Million	378 (20 years)
Production	$4.584 billion	$336 million	241 (40 years)
Total	$6.346 billion	$572 million	n/a

Source: UW 2001

Losses in total economic activity in southwest Wyoming associated with loss of forage resulting from Alternative A-related disturbance would be an estimated $692,000 over the 40-year LOP. Estimated total losses in earnings would be $126,000. An estimated annual average of 0.17 jobs would also result from the reduction in AUM's.

The estimated in-migrant population associated with Alternative A would be 400 in 2003, increasing to a peak of over 660 in 2021, falling to about 240 in 2023 (when drilling is scheduled to end), and decreasing steadily thereafter. As with the Proposed Action, this population would be distributed throughout southwest Wyoming but concentrated in Rock Springs and, to a lesser degree, Rawlins.

During the 20-year drilling cycle, an estimated monthly average of 97 workers would be working in the wellfield, with peak monthly averages occurring in August at 174 workers. Peak employment days could rise to about 290 in August if peak days on several wells occurred simultaneously. Employment levels would be increased by 12 workers for 7 days during periods when each of the anticipated six compressor stations are constructed. Similarly, employment levels would be increased by 24 workers for 21 days during periods when each of the two anticipated processing plants is constructed.

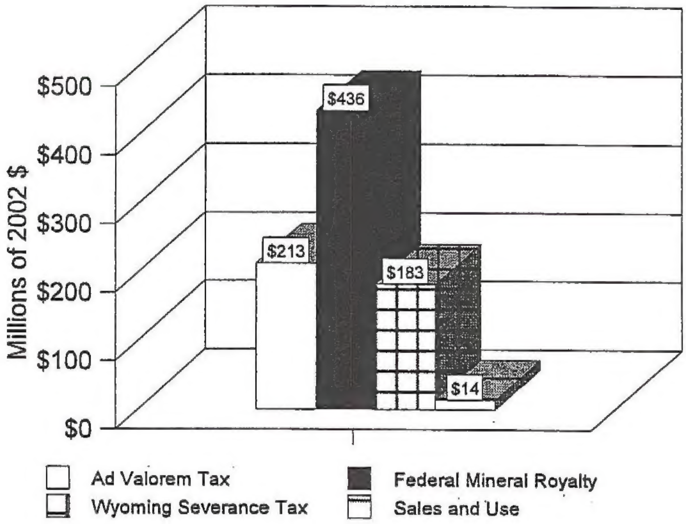
Most employees would be likely to locate in Rock Springs or Rawlins, although with the increased potential for multi-year drilling contracts in the DFPA, more workers may be induced to seek long-term residences in communities near the project area. Rock Springs and Rawlins have adequate housing resources (houses for sale and rent, apartments, mobile home pads and motels) to accommodate both long and short term housing demand associated with Alternative A. At present, Wamsutter and Baggs have little available housing and would be able to accommodate only a small portion of demand unless new housing resources are constructed. Most DFPA workers seeking short term lodging would have to travel to Rock Springs, Rawlins or Craig, Colorado.

As with the Proposed Action, most community services in Rock Springs and Rawlins have capacity to accommodate the relatively small incremental demand associated with Alternative A. Additionally, the substantial tax revenues generated by Alternative A would provide adequate funds to offset increased demand for local government facilities or services, although project-generated revenues may lag project-related demand for services.

The currently strained condition of certain public services in the Town of Wamsutter would be exacerbated if DFPA workers were to locate in the community. Neither Wamsutter nor Baggs would receive substantial revenues from oil and gas development, so they are limited in their ability to rapidly increase capacity of public facilities and services to accommodate increases in demand. Although there would be increased numbers of workers seeking housing under Alternative A, the lack of housing would prevent substantial numbers of workers from locating in these communities and increasing demand for services, at least in the near term.

Tax revenues would be increased by 50 to 55 percent under Alternative A. Figure 4-14 displays estimated tax revenues associated with this alternative. Alternative A-related tax and royalty revenues would total an estimated $846 million over the 40-year assessment period.

Figure 4-14. Total Ad Valorem Property Tax, Federal Mineral Royalty, Severance Tax and Sales and Use Tax Revenues Associated with Alternative A



Source: Blankenship Consulting LLC

The 54 percent increase in drilling, field development and production associated with Alternative A (contrasted with the Proposed Action) would amplify the effects on attitudes and opinions described in Section 4.11.3.6. As with the Proposed Action, Alternative A would receive general support in Sweetwater and Carbon counties, but certain population segments would experience an increase in negative effects. Hunters and other recreationists who use the DFPA would be more likely to feel that the hunting or recreation experience is diminished by changes in game patterns or changes in the undisturbed landscapes, isolation and solitude. Individuals and organizations who believe that public land within the MVMA should be left in its relatively undisturbed state would also be more dissatisfied under this alternative. Additionally, with the increased disturbance and wellfield activity, there is potential that an increased number of residents might feel that recreation resources and wildlife habitat would be impacted.

The potential for conflicts between grazing and drilling and field development activities would also increase, with corresponding potential for dissatisfaction among affected grazing permittees.

4.12.3.3 Alternative B - No Action

Under the No Action Alternative an unknown number of wells and ancillary facilities would be developed, including previously approved decisions for the Mulligan Draw and Dripping Rock/Cedar Breaks areas, and wells and ancillary facilities in other areas of the DFPA, which could be approved by the BLM on a case-by-case basis. Using the same assumptions as the Proposed Action and Alternative A, each well developed under the No Action Alternative would result in the following estimated economic impacts.

Short-term impacts of each well on grazing would total about $50 to $85 dollars in loss of total economic activity for each year of disturbance (depending on the location of the well), and $8 to $15 dollars in wages. Long term disturbance associated with a producing well would result in a

loss of an estimated $1,500 to $1,800 in total economic activity, and $263 to $358 in total wages over the 40-year LOP.

Table 4-26. Per Well Economic Impacts for a Dry Hole

	Drilling
Total Economic Impact	$2,118,556
Labor Earnings	$322,943
Total Jobs (AJE)	11

Note: job estimates include direct and indirect; AJE denotes annual job equivalents
Source: UW 2001

Table 4-27. Per Well Economic Impacts for a Producing Well

	Drilling	Completion	Production	Total
Total Economic Impact	$2,118,556	$1,319,634	$14,401,498	$17,839,688
Labor Earnings	$322,943	$116,925	$944,603	$1,384,471
Total Jobs (AJE)	11	4	0.68	n/a

Note: job estimates include direct and indirect; AJE denotes annual job equivalents, AJE's are not additive because they cover different periods.
Source: UW 2001

Based on the simulation presented in Section 4.12.3.1.3, DFPA employment associated with each well would average 15 workers during the first month of drilling, 19 during the second month and 11 during the third month or completion phase of a producing well. On a per well basis, population, housing and community service impacts of drilling, completion and production would be negligible, but as the level of development approaches the Proposed Action, impacts would similarly approach those described in Section 4.12.3.1.

Fiscal

Estimated total per well ad valorem, sales and use and state severance taxes and Federal Mineral Royalty revenues are displayed in Figure 4-15.

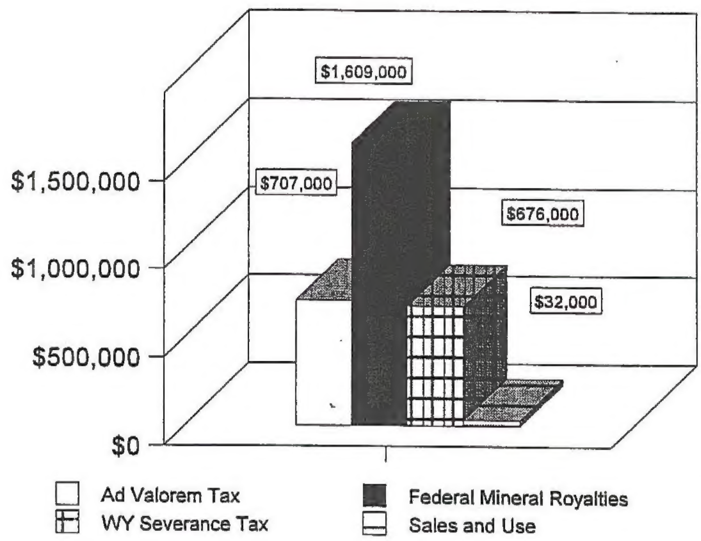
Per well tax and royalty revenues would total an estimated $3.195 million.

Attitudes and Opinions.

The No Action Alternative would result in dissatisfaction for some area residents who favor oil and gas development on public lands. Hunters and other recreationists who use the DFPA might experience negative impacts from changes in game patterns or changes in the undisturbed landscapes, isolation and solitude if wells were located in preferred hunting or recreation areas, but overall dissatisfaction could be substantially less than either action alternative, depending on the number of wells ultimately approved. Levels of dissatisfaction among individuals and organizations

who believe that public land within the MVMA should be left in its relatively undisturbed state would be dependent on whether or not wells were located within that area. The potential for conflicts with grazing activities would be reduced under this alternative, unless the ultimate number of wells drilled approached that of the Proposed Action.

Figure 4-15. Estimated Per Well Ad Valorem, Sales and Use, State Severance and Federal Mineral Royalty Revenues Per Well



Source: Blankenship Consulting LLC

4.12.4 Impacts Summary

Economic impacts of natural gas development and production would be largely positive under any of the three alternatives in this assessment.. Based on the assumptions used for this assessment, natural gas development would enhance regional economic conditions and generate substantial local, state and federal tax and royalty revenues. Economic benefits would be 50 to 55 percent higher under Alternative A than the Proposed Action. Total economic benefits for Alternative B cannot be estimated

Natural gas-related economic benefits may be diminished slightly by reductions in grazing, hunting and other recreation activity in the project area. However, recreation use of the DFPA is believed to be light, and some displaced recreation users may recreate elsewhere within the two-county region, resulting in minimal net loss to the regional recreation economy. The loss of grazing and recreation income would be greater under Alternative A than the Proposed Action.

For all alternatives, the relatively small population increment associated with drilling and field development would be disbursed throughout southwest Wyoming and accommodated in large part by existing housing and community services. Smaller communities such as Wamsutter and Baggs would not be able to accommodate substantial growth without additional housing and

improvements to community infrastructure. Project-related sales and use tax and property tax revenues would offset project-related demand for local government services in counties and larger communities, although revenues may lag demand in the early years of the project, depending on the pace of development. Smaller communities such as Wamsutter and Baggs would receive minimal direct tax revenues from natural gas development, limiting their ability to expand community infrastructure to accommodate project-related demand. Because of the limited housing resources in these communities, substantial project-related growth is not anticipated in the near-term.

Community acceptance of natural gas development would be mixed. Many residents would support the development, but those individuals, groups and organizations who feel that recreational resources and undisturbed landscapes would be negatively impacted by development on public land would be dissatisfied. The level of dissatisfaction would be correlated with the level and pace of development, therefore alternatives that resulted in higher levels of drilling and field development would generate higher levels of dissatisfaction among these individuals, groups and organizations.

4.12.5 Additional Mitigation Measures

No mitigation measures beyond those outlined in Section 2.5.2.11.2 are proposed.

4.12.6 Residual Impacts

Even after implementation of the mitigation measures outlined in Section 2.5.2.11.2, it is likely that dissatisfaction would remain among some hunters, recreationists and individuals and organizations who believe that public land within the MVMA and adjacent areas should be left in its relatively undisturbed state.

4.12.7 Environmental Justice

Neither the Proposed Action nor the other alternatives would directly effect the social, cultural, or economic well-being and health of minorities or low income groups. The DFPA is relatively distant from population centers, so no populations would be subjected to physical impacts from the Proposed Action or alternatives. Low income groups may indirectly benefit from the increased economic activity and secondary job opportunities resulting from all three alternatives.

4.13 TRANSPORTATION

4.13.1 Introduction

This section identifies potential effects of the Proposed Action and alternatives on the transportation system providing access to the DFPA (federal and state highways and county roads) and the road network within the DFPA (primarily BLM roads and a few roads accessing private lands). Potential effects of new and improved roads within the DFPA on soils, wildlife habitat, visual resources and range resources are described within those sections of the assessment.

4.13.2 Impact Significance Criteria

The following criteria are used to determine whether transportation impacts of the Proposed Action would be significant:

- Increases in traffic levels on the local public highway network that would cause the level of service on large segments of those public highways to fall below acceptable levels as defined by the responsible government agency.

- Measurable increases in accident rates on the local public highway network above the average accident rate for similar roadways which would increase the risk to highway users.

4.13.3 Direct and Indirect Impacts

4.13.3.1 Proposed Action

Federal and State Highways

The Proposed Action would generate increases in traffic volumes on highways and roads providing access to the project area. These increases would result from the movement of project-related workers, equipment and materials to and from the project area to perform drilling, field development, well service, field operations and reclamation activities.

Table 2-1 in Chapter 2 shows the estimated average number of trips associated with various well field activities. Drill rigs and certain other items of heavy equipment would be transported to the DFPA and remain onsite until their relevant work is completed. Materials and supplies would be delivered on an as-needed basis. Drilling and completion crews would commute to the DFPA daily. Other contractors and vendors would commute on an intermittent, as-needed basis.

Based on a simulation of drilling activities for a typical well and the timing of each of the annual average 19 wells which would be drilled within a calendar year, the Proposed Action would generate an estimated average of 32 trips per day. During summer months this average would average between 75 and 90 trips per day, during April and May there would be virtually no trips. Peak daily traffic could be substantially higher, particularly on days when rigs are moved into or out of the area or intensive completion activities occur. During operations, daily traffic would be reduced to an average of under 20 trips per day with higher peak days during workovers and other maintenance activities occurring on an intermittent basis.

Proposed Action-related average daily traffic would total less than one percent of 2000 ADT on I-80, and about 2 to 3 percent of 2000 ADT on WYO 789. In summer, Proposed Action-related traffic would approach 4 to 6 percent of 2000 ADT.

Based on the assumptions and estimates used for this assessment, the increase in area traffic associated with the Proposed Action would not result in a significant deterioration of level of service for I-80 or WY 789 (Rounds 2000).

Given the relatively small increment of traffic associated with drilling and field development, it is unlikely that the Proposed Action would result in a measurable increase in accident rates on I-80

or WY 789; during the operations phase, the probability of an increase in accident rates attributable to the Proposed Action would be negligible.

CO 13 may receive a minimal amount of project-related traffic increases on an intermittent basis if some DFPA workers seek temporary lodging in Craig. The anticipated low volume of traffic would not result in significant impacts to the highway or to highway safety.

County Roads

The Proposed Action would result in increases in traffic on the county roads that provide access to the DFPA, primarily SCR 23/CCR 701, the Wamsutter/Dad Road. CCR 700 provides access to the southeastern corner of the DFPA and is likely to receive substantially less use than the Wamsutter/Dad Road.

The Proposed Action would increase the already substantial amount of oil and gas-related traffic on the Wamsutter/Dad Road. Current impacts to this road, which has been reconstructed and maintained for oil and gas traffic, are more related to the speed of the traffic and use of the road during muddy conditions than traffic volume (Vanvalkenburg 2000, Nations 2000). The traffic associated with the Proposed Action would contribute to the already substantial maintenance requirements on the road. Incremental maintenance costs would be offset by the revenues generated to the counties by the Proposed Action (Section 4.12.3.1.6). However, in the initial years of the project, counties could be required to provide road maintenance without corresponding increases in project-related revenues if maintenance requirements occur before substantial production-related revenues began to accrue to the counties.

Internal Roads

There are no federal or state highways or county roads within the DFPA. Roads within the DFPA have been developed incrementally to serve oil and gas exploration, development and production activities and to provide access for grazing activities. Some casual roads and two tracks have developed over time to provide access for hunting and other recreational visitors. The existing transportation network within the DFPA (an estimated 661 miles of existing roads and two-track roads) is generally suitable for existing uses. Where possible, existing roads would be used to access wellfield facilities, but new roads would also be required, and certain roads would need to be upgraded to serve development and production needs associated with the Proposed Action. Based on the estimated average of 1.5 miles of road per well, a total of 542 miles of new or upgraded roads would be required. The Operators would be responsible for constructing and maintaining new and improved roads within the DFPA, and for maintaining existing roads. Section 2.5.2.1 (Access Road Construction) describes the measures proposed by the Operators to develop the transportation network necessary to access wells and ancillary facilities within the DFPA. Standards for road design and construction would be consistent with BLM Road Standards Manual Section 9113. DFPA operators would also establish maintenance agreements with designated responsibilities for maintaining all roads; existing, improved and newly constructed.

The increased traffic associated with drilling and field development (an average annual of 32 trips per day with possible daily peaks substantially higher) would accelerate maintenance requirements on existing, upgraded and new roads, particularly if roads are used during wet or muddy conditions. Damaged roads would primarily affect the activities of DFPA operators, although grazing operators and recreationists may also be temporarily affected. Based on the Operators' commitment to

construct and maintain roads, Proposed Action-related impacts on the transportation network within the DFPA would not be significant.

New road construction or upgrading of existing roads on private lands would conform to land owner standards. These standards may differ form BLM standards.

The increased traffic in the DFPA, particularly during the drilling and field development phase, would correspondingly increase the potential for vehicle/livestock accidents during that period. These potential impacts are discussed in Section 4.6.

Portions of the DFPA are located in areas that contain sensitive resources (e.g., cultural, soils, wildlife habitat and visual resources). Construction of new roads or improvement of existing roads in these areas have the potential to impact those sensitive resources, although BLM road standards, RMP stipulations, operator proposed mitigation measures and the preconstruction planning and site layout process described in Section 2.5.1 would minimize these impacts.

4.13.3.2 Alternative A

Alternative A would involve a 54 percent increase in well locations over the Proposed Action, therefore traffic impacts on federal and state highways and county roads would correspondingly be over 50 percent higher, although some economies of scale would occur if individual operators were to drill more than one well at a time. Under the assumptions used for this assessment, average daily traffic to the DFPA would be about 52 trips, with average daily traffic during summer months substantially higher. Peak day traffic would also be substantially greater, especially if rig moves or initiation of completion activities on several wells were to coincide. This increase in traffic would still be within tolerable service levels for federal and state highways that provide access to the DFPA. Alternative A-related increases in traffic would accelerate maintenance requirements on the Wamsutter/Dad Road, but would also provide corresponding increases in county tax revenues to offset maintenance costs. As with the Proposed Action, project-related tax revenues may lag project maintenance demand during the initial years of drilling and field development.

Implementation of Alternative A would require construction of an estimated 833 miles of new or upgraded roads within the DFPA. As with the Proposed Action, implementation of Operator commitments and BLM requirements for the construction and maintenance of roads would avoid significant impacts to the transportation network within the DFPA. Opportunities for vehicle/livestock accidents would be increased under Alternative A.

4.13.3.3 Alternative B - No Action

Under Alternative B, wells and ancillary facilities associated with the previously approved Mulligan Draw and Dripping Rock/Cedar Breaks areas and an unknown number of wells and ancillary facilities could be approved by the BLM on a case-by-case basis in other portions of the DFPA. Drilling and field development activity under the No Action Alternative could be substantial, but would occur without a coordinated transportation plan. Average daily traffic for each well developed under the No Action Alternative would be about 7 to 9 trips per day over a 2 to 3 month period, with substantially higher peak days during rig moves and completion activities. An estimated average of 1.5 miles of new or upgraded access road within the DFPA would be required for each well. Transportation impacts associated with the No Action Alternative would be dependent on the number of wells drilled and the pace of drilling and field development.

4.13.4 Impacts Summary

Transportation effects of natural gas development and production would include increased traffic on federal and state highways and county roads providing access to the DFPA, including US I-80, WYO 789, CO 13, SCR 23/CCR 701 (the Wamsutter/Dad Road), and CCR 700. There would also be a statistical increase in the potential for accidents on these roads. Given the small increase in traffic associated wit the development relative to existing traffic on these highways and roads, transportation impacts are not anticipated to be significant under any of the three alternatives considered for this assessment.

Transportation effects within the DFPA would occur on BLM and operator-maintained roads. Operators would be required to construct new roads and improve existing roads to BLM standards, except in cases where roads cross private surface. Operators would also be required to maintain new and existing roads accessing natural gas facilities within the DFPA. Based on these factors and the implementation of the coordinated transportation planning process described in Section 4.13.5, significant impacts to transportation systems within the DFPA are not anticipated for any alternative.

4.13.5 Additional Mitigation Measures

In addition to the Operator-committed measures and BLM-required procedures, outlined in Sections 2.5.2.1 and 2.5.2.11.2, a coordinated transportation plan (TP) should be developed for the DFPA. The coordinated transportation process could include the BLM, the Operators, private landowners, livestock operators, county road superintendents, recreation and environmental interest groups, and other interested parties.

4.13.6 Residual Impacts

A TP would minimize construction of new roads, foster proper sizing of roads and assign road maintenance responsibilities. The initial transportation planning effort would identify the most efficient and resource-sensitive locations for collector and local roads (existing roads should be used as collectors and local roads whenever possible to minimize the amount of surface disturbance within the area). However, because the locations of new wells and ancillary facilities are not currently known, transportation planning would continue to occur on an annual basis to: (1) identify the minimum road network necessary to support annual drilling and field development activities; (2) review and assign construction and maintenance responsibilities of the Operators; (3) identify roads appropriate for abandonment and reclamation; and (4) identify fences, gates and cattle guards which should be upgraded to accommodate heavy trucks and equipment.

Operator responsibilities for preventive and corrective maintenance of roads in the DFPA would extend throughout the duration of the project and include blading, cleaning ditches and drainage facilities, dust abatement, control of invasive, non-native species, maintenance of fences, gates and cattle guards and other requirements as directed by the BLM.

4.14 HEALTH AND SAFETY

4.14.1 Introduction

Potential health and safety impacts associated with the Proposed Action and alternatives are similar to those associated with existing conditions in the DFPA, although the risk of certain types of impacts would increase as the amount of natural gas development increases. Potential health and safety impacts include occupational hazards associated with oil and gas exploration and operations, risk associated with vehicular travel on improved and unimproved BLM roads, firearms accidents during hunting season and range fires.

4.14.2 Impact Significance Criteria

No specific health and safety standards were identified in the GRRA or GDRA RMPs. In general, health and safety effects of the Proposed Action would be considered significant if they resulted in substantially increased risk to the public.

4.14.3 Direct and Indirect Impacts

4.14.3.1 Proposed Action

4.14.3.1.1 Occupational Hazards

Two types of workers would be employed in the DFPA: oil and gas workers, who had a1999 accident rate of 3.3 per 100 full-time workers, and special trade contractors, who had a non-fatal accident rate of 8.8 per 100 workers (U.S. Department of Labor, Bureau of Labor Statistics 2000). These rates compare with an overall private industry average for all occupations of 6.2 accidents per 100 workers. During the 20 -year drilling and field development phase of the project when an annual average of 61 drilling and field development workers and 10 to 20 operations workers would be performing work in the DFPA, it is statistically probable that about 8 injuries (loss time and non-loss time) would occur each year. Anticipated accidents would be slightly higher during years when compressor stations and the gas processing plant would be under construction. Once drilling and field development are completed, the annual statistical probability of injuries would be less than one, given the relatively low level of employment in the DFPA (less than 20 workers).

The US BLM, OSHA, USDOT and Wyoming OGCC each regulate particular safety aspects of oil and gas development. Adherence to relevant safety regulations on the part of the Operators and enforcement by the respective agencies would reduce the probability of accidents. Additionally, given the remote nature of the project area, and the relatively low use of these lands (primarily grazing permittees and a small number of hunters and other recreationists.), occupational hazards associated with the Proposed Action would mainly be limited to employees and contractors rather than the public at large.

4.14.3.1.2 Pipeline Hazards

Increasing the miles of gathering line within the analysis area would increase the chance of a pipeline failure. Accidents rates for gas transmission pipelines are historically low. Nationwide, injuries associated with gas transmission pipelines averaged 14 per year from 1990 through 1996, fatalities averaged one per year and incidents such as ruptures averaged 79 per year (U.S.

Department of Transportation 1998). Therefore, the relatively small amount of new pipeline associated with the Proposed Action (an estimated 350 miles), coupled with the low probability of failure and the remoteness of the project area would result in minimal risk to public health and safety. Signing of pipeline ROW's could reduce the likelihood of pipeline ruptures caused by excavation equipment--particularly in the vicinity of road crossings or areas likely to be disturbed by road maintenance activities.

4.14.3.1.3 Hazardous Materials

Drilling, filed development and production activities require use of a variety of chemicals and other materials, some of which would be classified as hazardous (see Appendix D: Hazardous Substance Management Plan). Potential impacts associated with hazardous materials include human contact, inhalation or ingestion and the effects of exposure, spills or accidental fires on soils, surface and ground water resources and wildlife.

The risk of human contact would be limited predominately to DFPA operator and contractor employees. The Hazardous Substance Management Plan, Hazard Communication Program, Spill Prevention Control and Countermeasure (SPCC) Plans, and other mitigation measures described in Section 2.2.2.11 would reduce the risk of human contact, spills and accidental fires, and provide protocols and employee training to deal with these events should they occur. Based on successful implementation of the above-listed plans and procedures, no significant impacts associated with hazardous materials would be anticipated.

4.14.3.1.4 Other Risks and Hazards

Highway safety impacts are discussed in Section 4.12 (Transportation). Sanitation and solid waste impacts would be avoided or reduced by the implementation of the mitigation measures outlined in Section 2.2.2.11.2.

The potential for firearms-related accidents would occur primarily during hunting season. The substantial activity in portions of the project area during drilling and field development would encourage hunters to seek more isolated areas thus reducing the potential for accidents. During operations, the relatively few personnel on site would result in minimal risk of firearms-related accidents.

The risk of fire in the analysis area would increase under the Proposed Action. This is an unavoidable impact associated with construction activities, industrial development and the presence of fuels, storage tanks, natural gas pipelines and gas production equipment. However, this risk would be reduced by the placement of facilities on pads and locations that are graded and devoid of vegetation which could lead to wildfires. In the event of a fire, property damage would be limited to construction or production related equipment and range resources. Fire suppression equipment, a no smoking policy, shutdown devices and other safety measures typically incorporated into gas drilling and production activities would help to minimize the risk of fire. There would be a heightened risk of wildfire where construction activities place welding and other equipment in close proximity to native vegetation. Given the limited public use and presence in the project area, the risk to the public would be minimal. There would be a small in increase in risk to area fire suppression personal associated with the Proposed Action.

Based on the foregoing assessment, risks to public health and safety should not significantly increase as a result of the Proposed Action.

4.14.3.2 Alternative A

Under Alternative A, the number of wells drilled would be increased by about 54 percent. An annual average of about 10 occupational accidents would be anticipated during drilling and field development and less than one after drilling has been completed. The increase in other types of accidents would also be increased because of the higher level of activity within the DFPA during drilling and field development. Given the remoteness and isolation of the DFPA, the health and safety impacts to the general public would not be significant.

4.14.3.3 Alternative B - No Action

Under the No Action Alternative, health and safety risks would continue at levels previously authorized for Mulligan Draw and Dripping Rock, and be associated with natural hazards, grazing and recreation activities, and natural gas development approved on a case-by-case basis.

4.14.4 Impacts Summary

Hazards associated with the drilling program, including construction and operation, are those normally associated with heavy construction and industrial work. There would be a minor increased risk to the public caused by project implementation resulting from additional drilling and production related traffic in the DFPA. None of these impacts occur at significant levels.

4.14.5 Additional Mitigation Measures

The mitigation measures described in Section 2.2.5.11.2 should be sufficient to mitigate risks to public health and safety.

4.14.6 Residual Impacts

Given the application of the mitigation measures outlined in Section 2.5.2.11.2 and considering that no additional mitigation measures are proposed, no residual impact discussion is required. Impacts would remain the same as described in Section 4.14.3.

4.15 NOISE

4.15.1 Introduction

Noise associated with the Proposed Action and alternatives would be caused by machinery used during drilling and construction of pipelines and access roads, construction and operation of ancillary facilities, and by heavy trucks and related equipment.

4.15.2 Impact Significance Criteria

The following criteria was used to assess the significance of noise impacts related to this project:

- Long-term activities that would exceed federal 55 dBA maximum standards for noise at either human or animal sensitive locations.

4.15.3 Direct and Indirect Impacts

Overall, noise produced by drilling, field development and operations would be moderate because of the dispersed and short-term nature of these activities. Given the remoteness and isolation of the DFPA, drilling, field development and operations activities associated with drilling, field development and production operations would not affect noise sensitive locations for humans. Other users of the DFPA would be affected infrequently for periods of short duration as they move through the area. Affects on noise sensitive locations for animals would be avoided by implementation of the preconstruction planning and design measures described in Chapter 2.

4.15.3.1 Proposed Action

Noise associated with drilling, field development and production could potentially affect human comfort and safety (at extreme levels) and modify animal behavior. Noise levels in excess of the 55 dBA maximum standards can occur during construction and maintenance of well sites, access roads, ancillary facilities such as compressor sites and pipelines. However, perception of sound varies with intensity and pitch of the source, air density, humidity, wind direction, screening/focusing by topography or vegetation, and distance to the observer. Under typical conditions, excess levels decline below the level of significance (55 dBA) at 3,500 feet from the source. Drilling and field development-related noise impacts would be short-term, occurring on an intermittent basis at different locations throughout the DFPA throughout the estimated 20-year drilling and field development cycle. Substantially lower and less frequent noise disturbances would occur throughout the productive life of the field.

Noise sensitive locations include areas that are routinely occupied or frequented by humans or animals. In general, it has been found that mammals and birds will consistently escape from noises that exceed 75-85 dBA. Below that level, noise sensitivity would vary by species.

Human sensitivity to noise would depend, in part, upon proximity to the noise source, background noise levels, physiology, frequency and the intended activity. For example, non-motorized recreation users may be more sensitive to noise impacts than most other resource users. However, current recreation use of the DFPA is believed to be low.

Studies have found that big game move away from frequently traveled roads. A study of the Birch Creek area of the BLM RSFO found that displacement of big game animals away from drilling rigs occurs but that animals quickly return to the area once drilling has been completed--despite some increase in maintenance-related traffic (Reeve 1995). Sage grouse are also known to be affected by high levels of noise (see Section 4.7.4.1.4).

The preconstruction planning and design measures discussed in Section 2.5.1 would avoid locating well sites and ancillary facilities in noise sensitive areas for animals. Given the remoteness and isolation of the DFPA, no noise sensitive locations for humans (such as residences or places of

business) would be affected. Grazing operators and recreationists using the DFPA may temporarily be affected by noise disturbances as they move through a construction or drilling area, however, such contacts are anticipated to be infrequent and short in duration. Drilling, construction and operations workers would be subject to federal and state health and safety standards for sound protection. Given these circumstances, and assuming successful implementation of the mitigation measures proposed in Chapter 2 and Section 4.14.5, noise impacts associated with the Proposed Action would not be significant.

Noise impacts could occur within the Adobe Town WSA if wells, ancillary facilities or roads were located near the WSA boundary. Depending on the location of the activity relative to the WSA boundary, the nature of the activity and the terrain between the activity and the WSA boundary, WSA users could hear natural gas activities, particularly during the drilling and field development stages of the project. These impacts would diminish substantially during project operations, and be limited primarily to vehicular traffic and occasional well maintenance activities. The magnitude of noise impacts within the WSA would depend on the number and type of facilities located near the boundary, the time of year, and actual use of the portions of the WSA near natural gas activities.

4.15.3.2 Alternative A

The implementation of Alternative A would increase the number of wells drilled over the Proposed Action by about 55 percent. While the noise levels at individual drill sites and ancillary facilities would be similar to those associated with the Proposed Action, noise-generating activities would occur more frequently at more locations within the DFPA. The location of no more than four wells per section and the short-duration of drilling and field development activities would minimize cumulative noise impacts within the DFPA. Noise levels associated with drilling, field development and construction traffic would also be greater under this alternative as would opportunities for impacts on noise sensitive locations for animals. However, properly implemented preconstruction planning and design measures would avoid such impacts.

Given the increased densities of well pads associated with Alternative A, it is possible that more wells, roads and ancillary facilities would be located adjacent Adobe Town WSA boundaries, if substantial natural gas reserves are found in that area. Consequentially, the potential for noise impacts to human users of the WSA would be increased under this alternative.

4.15.3.3 Alternative B - No Action

Implementation of Alternative B would result in noise producing activities similar to those described for the Proposed Action and Alternative A. The total amount, frequency and duration of noise producing activities would depend on the level of development that would actually occur in the DFPA under the No Action Alternative. Development under Alternative B could include the 57 wells and ancillary facilities already approved for the Mulligan Draw and Dripping Rock/Cedar Breaks areas and additional wells and ancillary facilities approved by the BLM on a case-by-case basis in other portions of the DFPA.

Under the No Action Alternative, 23 wells could be developed in the Mulligan Draw area, which borders the Adobe Town WSA. Additionally, wells approved in the southwestern portion of the DFPA on a case-by-case basis could border the WSA. Noise impacts to human users of the WSA would depend on the number of wells, ancillary facilities and roads developed adjacent to the WSA

boundary, terrain, time of year, and the number of users of the portion of the WSA adjacent to natural gas development.

4.15.4 Impacts Summary

Given the size and remote nature of the DFPA, the low human population densities in surrounding areas and the operator committed mitigation measures, significant noise impacts on human populations are not anticipated under any alternative. Although noise impacts would occur more frequently at more locations under Alternative A than under the Proposed Action or Alternative B, project workers would be the principally affected population, and they would be protected by OSHA and other health and safety regulations. Grazing operators and recreationists using the DFPA are likely to experience noise impacts for brief periods when passing through areas where drilling, construction or maintenance activities are underway. Noise impacts would be greatest during the drilling and field development phase of the project. During project operations, noise impacts would be substantially reduced.

The preconstruction planning and design measures discussed in Section 2.5.1 would prevent the location of well sites and ancillary facilities in noise sensitive areas for animals under all alternatives.

Depending on the location of wells, ancillary facilities and roads in areas adjacent the Adobe Town WSA boundary, users of the WSA could be impacted by noise, principally from drilling and field development activities. During the operations phases of the project, noise impacts on users of affected portions of the WSA would be minimal.

4.15.5 Additional Mitigation Measures

No mitigation measures are proposed beyond those described in Section 2.5.2.11.2.

4.15.6 Residual Impacts

Given the application of the mitigation measures outlined in Section 2.5.2.11.2 and considering that no additional mitigation measures are proposed, no residual impact discussion is required. Impacts would remain the same as described in Section 4.15.3.

CHAPTER 5

CUMULATIVE IMPACT ANALYSIS

CHAPTER 5

CUMULATIVE IMPACTS ANALYSIS

5.1 INTRODUCTION

NEPA requires an assessment of potential cumulative impacts. Federal regulations (40 CFR 1508.7) define cumulative impacts as:

> *"...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."*

Potential cumulative impacts are assessed at the resource level. The cumulative impact analysis (CIA) area for past, existing and reasonably foreseeable future activities (RFFA's) that may generate cumulative impacts varies depending on the resource under consideration. For example, the CIA area for air quality effects is regional in nature; therefore the scope of activities considered is necessarily broad. In contrast, the CIA area for geology and minerals considers the project area associated with the proposed action and alternatives; therefore the scope of potential cumulative activities considered is much narrower.

This discussion of potential cumulative impacts assumes the successful implementation of the environmental protection and mitigation measures discussed in chapters two and four of this EIS as well as compliance with the GRRA and GDRA RMP's and all applicable federal, state and local regulations and permit requirements. The analysis of cumulative impacts addresses both potential negative and positive impacts.

5.2 PAST, EXISTING AND REASONABLY FORESEEABLE FUTURE ACTIVITY

Past, existing and RFFA's are organized by CIA area and include the following:

5.2.1 Desolation Flats Project Area

Historic and existing activities in the DFPA include cattle grazing, dispersed recreation and oil and gas exploration, development and production. Reasonably foreseeable future activities within the DFPA are limited to the Proposed Action and alternatives.

The previously approved Mulligan Draw Project is located within the DFPA and is included in the proposed Desolation Flats EIS for analysis of the potential for increased well density of up to four wells per section. The Mulligan Draw Environmental Impact Statement (USDI-BLM 1992b) was completed in August 1992 and provided an analysis of a planned natural gas production project on public lands located in the northwest portion of the DFPA. Celsius Energy Company and other operators planned to drill approximately 45 total wells on 640 acre spacing over a span of several years to develop the natural gas reserves in the Mulligan Draw field. A total of 15 wells have been drilled in the Mulligan Draw area and an estimated 23 remain to be drilled.

The Dripping Rock Unit/Cedar Breaks Area is also included within the DFPA. The EA for this proposal involved a proposal to drill 58 natural gas wells on 640-acre spacing. To date 17 wells have been drilled in these units.

While future natural gas proposals are possible, the Proposed Action incorporates all reasonably foreseeable natural gas activity within the project area based on current knowledge of the area's geology and natural gas drilling and development technology. If these factors change and additional proposals are submitted, or significant changes in the Proposed Action are warranted, additional NEPA assessment (including cumulative impact analysis) would be required.

5.2.1.1 Disturbance within the Desolation Flats Project Area

Existing disturbance within the DFPA is approximately 1506.4 acres, or around 0.6 percent of the 233,542 acres comprising the project area. During the construction phase, the Proposed Action would disturb 4,923 acres and Alternative A would disturb 7,582 acres. Under Alternative B (No-Action) additional surface disturbance would occur on a case-by-case basis as individual wells are authorized by the BLM. Disturbance areas within the DFPA area would be reduced upon reclamation of pipeline ROW's and unused portions of drill pad and ancillary facility disturbances during the production phase for each alternative. Under the Proposed Action, reclamation would reduce impacts to 2,139 acres for a cumulative impact of 3,645.4 acres or 1.6 percent of the DFPA. Alternative A impacts would decrease to 3,300 acres, with cumulative impacts affecting 4806.4 acres or about 2.1 percent of the DFPA.

5.2.2 Southeastern Sweetwater County/Southwestern Carbon County CIA Area

Past and historic activities occurring in the area surrounding the Proposed Action include oil and gas exploration, development and production, dispersed recreation, ranching and grazing, and residential, commercial and industrial development in the communities of Wamsutter and Baggs.

RFFA's in adjacent areas primarily involve natural gas development. The Proposed Action is located in an area of intensive natural gas development. The projects and the NEPA documents from which potential cumulative impacts were obtained are listed below.

- <u>The Greater Wamsutter Area II (GWA II) Natural Gas Development Project Environmental Impact Statement (USDI-BLM 1995)</u> provided an analysis of impacts associated with a maximum development pattern of 750 new production wells at 300 locations within the GWA II and associated access roads, pipelines, and other ancillary facilities. The GWA II analysis area is located to the northeast of the DFPA and includes approximately 334,191 acres.

- <u>The Continental Divide/Wamsutter II Natural Gas Development Environmental Impact Statement (USDI-BLM 1999a)</u> includes the Continental Divide area combined with the GWA II area. The combined project area is generally located in Townships 15 through 23 North, Ranges 91 through 99 West, in Sweetwater and Carbon counties, Wyoming. The total combined area encompasses approximately 1,061,200 acres. This project is located north of the DFPA.

  Development within the GWA II reached the levels analyzed in the EIS for that project (300 well locations). Directional drilling proved to be technically impractical or uneconomical in

many areas within the GWA II project area, and additional well locations beyond those analyzed in the GWA II EIS were required to develop the anticipated 750 production wells. The expansion of development in the GWA II area and development in the Continental Divide area were combined in one analysis to make NEPA compliance more efficient and to facilitate the analysis of cumulative impacts.

The CD/WII EIS provides an assessment of environmental impacts associated with development of 3,000 natural gas wells. Based on that assessment, the BLM approved development of up to 2,130 wells, 50 percent on federal lands within the project area, beginning in 1999 and continuing for approximately 20 years, with a project life of 30 to 50 years. Various associated facilities (e.g., roads, pipelines, power lines, water wells, disposal wells, evaporation ponds, compressor stations, etc.) would also be constructed.

- <u>Creston/Blue Gap Natural Gas Project Environmental Impact Statement (USDI-BLM 1994a)</u> was approved on October 4, 1994, and provides an assessment of the environmental consequences of a proposed natural gas development project located north and east of the DFPA. The BLM's decision allowed a maximum of 275 wells on 250 locations on a 160-acre spacing pattern.

- <u>Uinta Basin Lateral Pipeline Environmental Assessment (USDI-BLM 1992c)</u> was completed in January 1992 and provided an analysis of impacts associated with construction and use of a 20-inch natural gas pipeline located west and north of the DFPA. Total length of the proposed pipeline is approximately 222 horizontal miles and would transport natural gas from various supply sources in the Uinta Basin of eastern Utah and the Piceance Basin of western Colorado to natural gas mainlines located near Wamsutter, Wyoming.

- <u>The Hay Reservoir Unit Natural Gas Development Environmental Assessment (USDI-BLM 1992d)</u> involved a natural gas producing area located northwest of the DFPA and GWA II. It analyzed impacts of an increase of up to 20 additional wells over two years, in addition to 24 existing wells.

- <u>The South Baggs Area Natural Gas Development Project EIS (USDI-BLM 1999c)</u> analyzed potential impacts of drilling 50 additional natural gas wells in the South Baggs area which is located southeast of the DFPA.

- <u>The Vermillion Basin Natural Gas Exploration and Development Project Environmental Assessment (USDI-BLM 2000)</u> analyzed potential impacts of drilling up to 56 wells in the 92,490-acre Vemillion Basin Project Area (VBPA), located 24 miles southwest of the DFPA.

- The BLM has issued a scoping notice for the preparation of an EIS for the proposed <u>Atlantic Rim Coalbed Methane Development Project</u>, located east of the DFPA. The proposed project area encompasses approximately 310,335 acres, of which 199,558 are federal surface, 15,156 are State of Wyoming lands and 94,621 acres are private surface. For the purpose of environmental assessment, the Atlantic Rim operators have indicated that a maximum of 3,880 coalbed methane wells may be drilled in the Atlantic Rim area over a 6 to 10-year period. The productive life of the field is estimated at 20 to 30 years. While the Atlantic Rim EIS is being prepared, the BLM would allow drilling of a maximum of 200 exploration wells in nine pod locations specifically for the acquisition of data necessary for the completion of the EIS.

Because potential impacts associated with the 3,880-well proposal have not yet been identified, they cannot be considered in the analysis of potential cumulative impacts for the Desolation Flats EIS. However, this cumulative analysis does consider the environmental effects associated with the 200 test wells. The forthcoming Atlantic Rim EIS would provide an analysis of the cumulative impacts of the full 3,880-well proposal, which would include the Desolation Flats project and the other projects listed above.

5.2.3 Watershed CIA Area

Cumulative analysis of natural resources that relate to watershed function and stability should occur at the watershed level. Thus, the CIA area for soils, water resources, vegetation and wetlands includes two components: (1) an analysis of potential cumulative impacts within the DFPA, and (2) an analysis of potential cumulative impacts within watersheds that contain the DFPA.

The watershed area considered in the CIA was defined following USDI-BLM (1994c) guidelines based on the USGS delineated watershed boundaries that contain or are adjacent to the DFPA. The DFPA falls predominantly within the Sand Creek and Barrel Springs Draw drainage basins; however, a very small (negligible) portion of the DFPA drains into Cherokee Creek, a tributary of the Little Snake River. The total CIA area is approximately 589,607 acres in size. The CIA area includes those portions of the Creston/Blue Gap, Continental Divide/Wamsutter II, and South Baggs EIS study areas that fall within the Sand Creek and Barrel Springs Draw drainage basins. Figure 5-1 depicts the location and relationship of the DFPA and the considered watersheds.

For threatened, endangered, and sensitive fish species, the Watershed CIA is extended to the Muddy Creek and Northwest Little Snake River (Sand Creek) watersheds (Figure 5-4). Both of these watersheds drain into the Little Snake River.

5.2.3.1 Disturbance within the Watershed CIA Area

Cumulative disturbance within the watershed CIA area includes estimated disturbance associated with the Desolation Flats project and existing and future disturbance associated with those portions of the Creston/Blue Gap, Continental Divide/Wamsutter II and South Baggs projects located within the Barrel Springs and Sand Creek drainage areas. No other permitted projects or RFFA's within the CIA area are currently anticipated.

The total existing and future disturbance in the watershed CIA area is estimated at approximately 5,220 acres, or 0.89 percent of the CIA (this disturbance estimate takes reclamation and future disturbance into consideration).

For the combined Muddy Creek and Northwest Little Snake River watersheds, cumulative disturbance is estimated to be 19,609 acres, or 1.7 percent of the two watersheds combined.

5.2.4 Regional CIA Area

The regional perspective is useful primarily for the analysis of air quality and socioeconomic impacts. The southwest Wyoming and Northwest Colorado region includes extensive oil and gas development, grazing and ranching, recreational development and dispersed recreation use, coal and trona mining, soda ash, fertilizer and electric power production, and residential, commercial and industrial development. There are also several highways and Interstate 80 which must be considered in the analysis of cumulative air quality impacts.

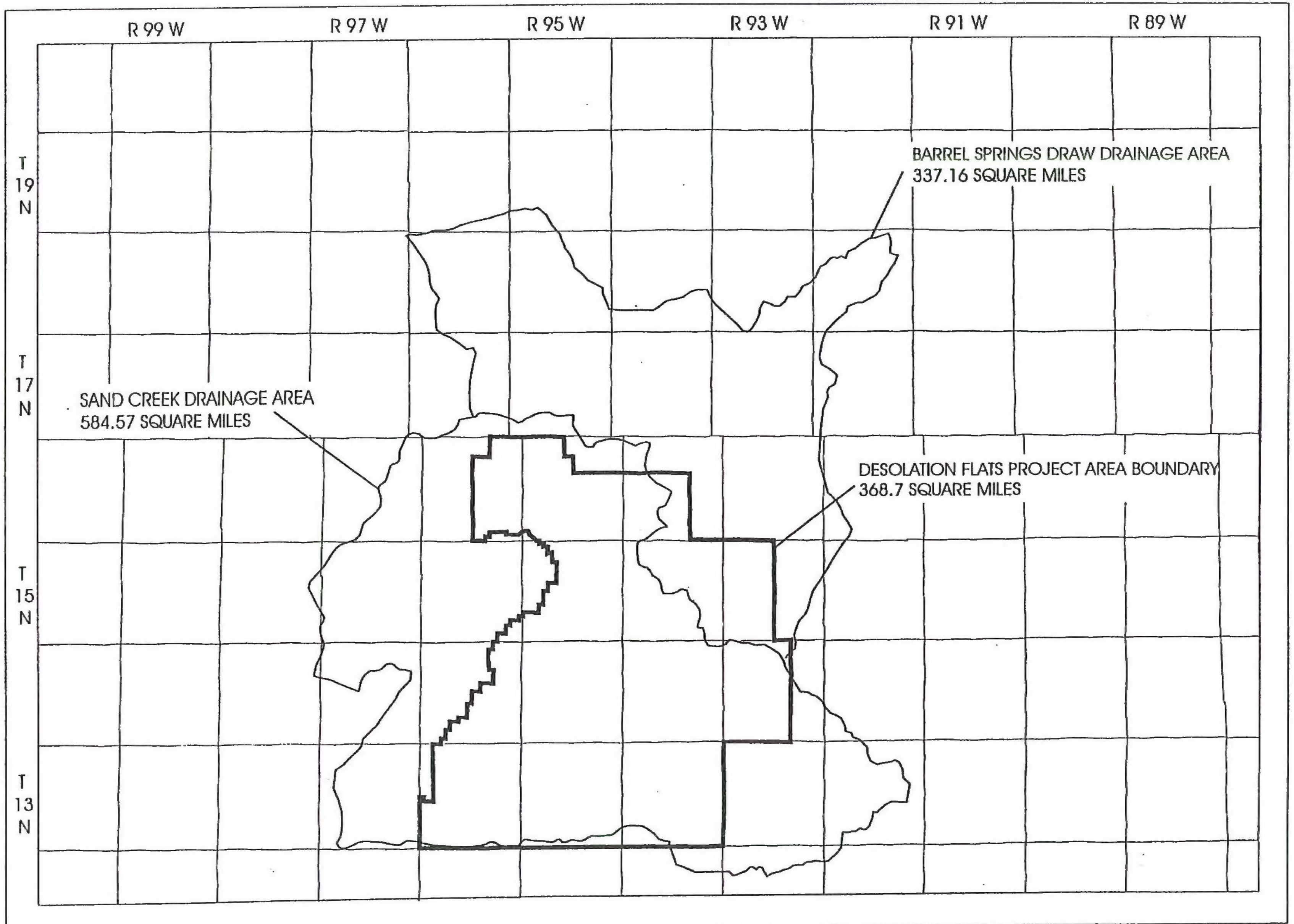


Figure 5-1. Watershed Boundaries Used in the Cumulative Impacts Analysis

5.3 POTENTIAL CUMULATIVE IMPACTS BY RESOURCE

5.3.1 Geology/Minerals/Paleontology

The CIA area for geology, minerals, and paleontology is the DFPA. Resources within the DFPA have not been significantly affected by present and existing activities and are not anticipated to be significantly affected by the Proposed Action or alternatives. The Proposed Action and alternatives are the only RFFA within the DFPA, therefore, cumulative impacts on geology, minerals and paleontology are not anticipated.

5.3.2 Climate and Air Quality

The CIA area for climate and air quality consists of southwestern Wyoming and northwestern Colorado. Cumulative impacts result from the development of the DFPA and other NEPA approved projects in combination with state permitted sources and other sources not subject to NEPA analysis.

5.3.2.1 Cumulative Emissions Inventory

For the cumulative analysis, three additional emission inventories were developed and combined with the Desolation Flats project emissions. One of the additional inventories accounted for emissions from state permitted sources that began operation between July 1995 and January 2001. Emissions for sources operating before 1995 were assumed to be included in the background monitoring data. Permit records obtained from the WDEQ-Air Quality Control Division and the CDPHE-Air Pollution Control Division provided the basis for this inventory. Both permitted emission increases and decreases were accounted for in the inventory. One notable permitted emission decrease was the installation of low NO_X burners on boiler #3 at the Naughton power plant. This control project resulted in a 1,000 ton per year decrease in NO_X emissions.

A second emission inventory addressed changes in existing well emissions that occurred between the 1995 baseline monitoring date and January 2001. To account for emissions resulting from new wells drilled in the region and the decline in production or the abandonment of existing wells, production figures between the 1995 baseline date and January 2001 were used to estimate the change in well emissions by county. Both county wide increases and decreases in well emissions were observed in this inventory.

The remaining emission inventory accounted for emissions from Reasonably Foreseeable Development (RFD). The RFD category was comprised of emissions addressed in previously approved NEPA actions that had not been constructed as of January, 2001. Table 5-1 summarizes the NEPA actions included in the analysis while Figure 5-2 presents the location of the projects.

The estimated emissions from sources permitted between 1995 to 2001, along with the changes in producing well emissions and future RFD emissions were added to the Desolation Flats emissions to obtain the cumulative emissions inventory (see the Air Quality Technical Report for a more detailed discussion of the emission inventories). Table 5-2 presents a summary of the cumulative emission inventory.

Table 5-1. NEPA Approved Reasonable Foreseeable Development

Approved NEPA Action	Map Symbol	Project Area	Remaining Wells to Be Developed	Remaining Compression to Be Installed (hp)
BTA Bravo	BB	23.80	2	0
Burley	BR	3.18	16	560 [1]
CAP Big Piney - Labarge	BP	501.65	200	0
Castle Creek Unit	CC	74.92	10	0
Continental Divide/Wamsutter II	CD	3,701.32	1,768	58,100 [2]
Creston/Blue Gap	CB	1,272.00	156	5,460 [3]
East LaBarge	EL	22.30	9	0
Essex Mountain	EM	50.67	3	0
Fontenelle Reservoir	FR	414.63	1,017	0
Hickey-Table Mountain EA	HK	79.54	39	0
Jack Morrow Hills CAP EIS	JM	936.82	108	3,480
Jonah II EIS	J2	153.65	285	0
Miscellaneous Wells - East	WE	126.94	15	0
Miscellaneous Wells - West	WW	1,517.28	185	0
Moxa Arch	MA	972.68	1,162	17,066
Pinedale Anticline EIS	PA	798.63	700	26,000
Riley Ridge	RR	541.40	209	0
Sierra Madre	SM	76.68	9	0
South Baggs	SB	214.08	43	2,580 [4]
Stagecoach Draw	SD	150.39	59	0
Vermillion Basin	VB	372.29	56	NO_X Specified [5]
Bridger-Teton DEIS including the following four management areas:				
Hoback Basin	HB	326.36	10	0
Moccasin Basin	MB	234.63	5	0
Union Pass	UP	354.63	5	0
Upper Green River	GR	617.79	10	0

[1] Compression estimated at 35 hp per well
[2] A total of 70,000 hp was approved, the amount installed was estimated based upon well completion
[3] Compression estimated at 35 hp per well
[4] A total of 3,000 hp was approved, the amount installed was estimated based upon well completion
[5] Compression emissions were specified at 200 tons per year NO_X

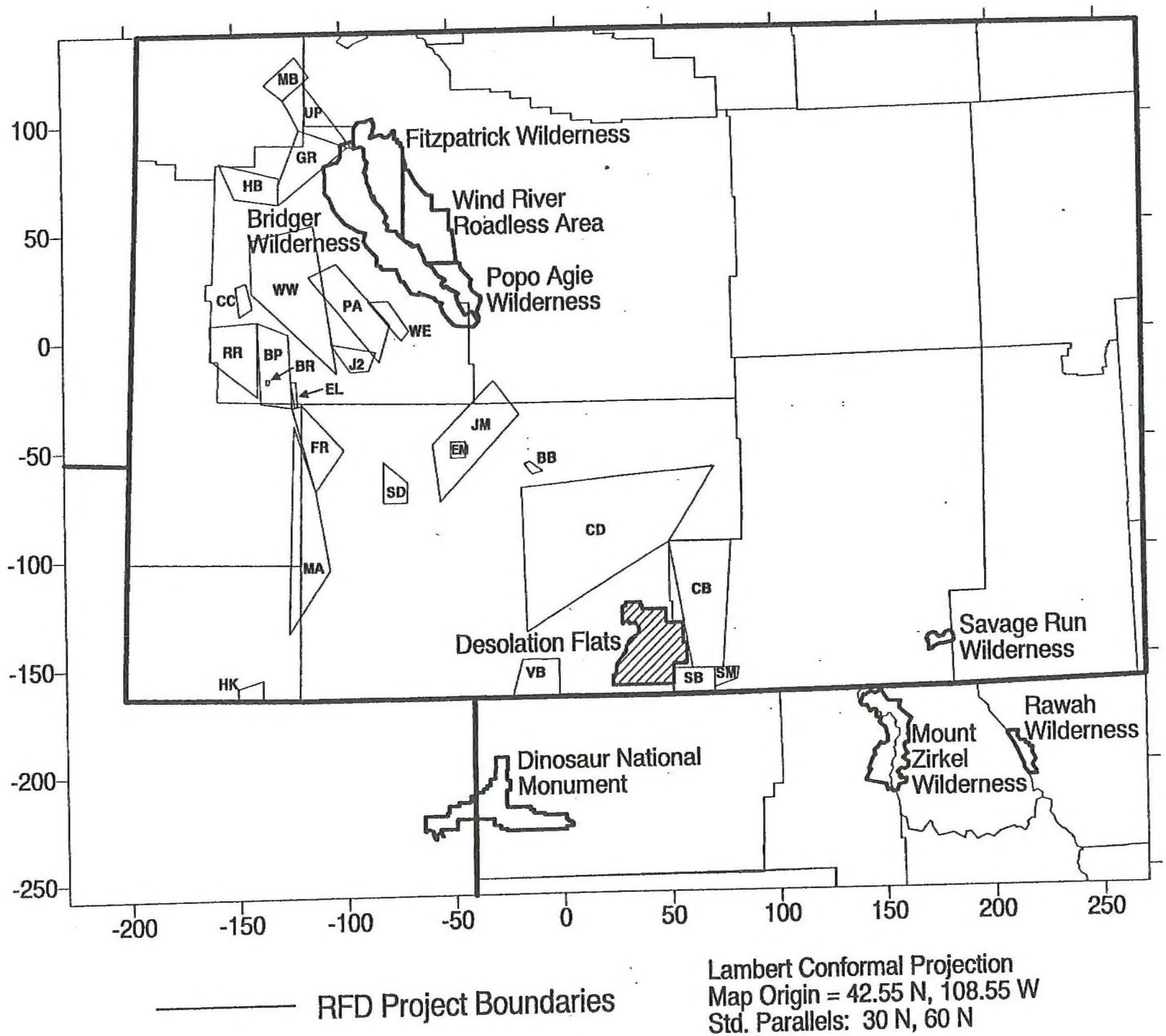


Figure 5-2. Reasonably Foreseeable Development Projects

Table 5-2. Cumulative Emission Inventory Summary.

Inventory Category	NO_x (TPY)	SO_x (TPY)	PM_{10} (TPY)	$PM_{2.5}$ (TPY)
Permitted Emission Increases Post 1995	7,011	4,305	2,110	846
Permitted Emission Decreases Post 1995 (Excluding Naughton)	(1,777)	(557)	(737)	(273)
Naughton Low NO_X Burners	(1,000)			
Regional Gas Wells Post 1995	(13)			
Desolation Flats Project	1,072	12	295	79
Reasonably Foreseeable Development	1,640			
Cumulative Emissions	6,933	3,760	1,668	652

5.3.2.2 Cumulative Far-Field Air Quality Impacts

The CALPUFF model was applied to estimate far-field air quality and Air Quality Related Value (AQRV) impacts resulting from cumulative emissions including the Desolation Flats project, state permitted emission sources, producing natural gas wells and approved NEPA actions. Potential impacts on air quality were estimated at PSD Class I and Class II sensitive receptor areas. The analyzed sensitive receptor areas were comprised of:

- Bridger Wilderness (Class I);
- Fitzpatrick Wilderness (Class I);
- Popo Agie Wilderness (Class II);
- Wind River Roadless Area (Class II);
- Dinosaur National Monument (Class II);
- Savage Run Wilderness (Class I);
- Mount Zirkel Wilderness (Class I), and
- Rawah Wilderness (Class I).

The CALPUFF model was used to estimate ambient NO_2, SO_2, PM_{10} and $PM_{2.5}$ concentrations to evaluate potential cumulative impacts and for comparison with applicable ambient air quality standards and PSD increments. The maximum cumulative impacts from all sources occurred at different sensitive areas depending upon the pollutant under consideration and the applied averaging time. As shown in Tables 5-3 and 5-4, the maximum cumulative impacts from all sources, including Desolation Flats, do not exceed the ambient air quality standards or the PSD Class I increments.

Table 5-3. Comparison of Cumulative Air Quality Impacts with Ambient Air Quality Standards

Pollutant and Averaging Time	Maximum Impact Location	Cumulative Impact ($\mu g/m^3$)	Monitored Back-ground Level ($\mu g/m^3$)	Maximum Impact Plus Back-ground ($\mu g/m^3$)	National Ambient Air Quality Standard ($\mu g/m^3$)	Wyoming Ambient Air Quality Standard ($\mu g/m^3$)	Colorado Ambient Air Quality Standard ($\mu g/m^3$)	Percentage of Most Stringent Ambient Air Quality Standard
NO_2 Annual	Bridger	0.763	10	10.763	100	100	100	11%
SO_2 3-hr	Dinosaur	2.886	29	31.886	1,300	1,300	700	5%
SO_2 24-hr	Dinosaur	0.862	18	18.862	365	260	365	7%
SO_2 Annual	Dinosaur	0.014	5	5.014	80	60	80	8%
PM_{10} 24-hr	Rawah	0.105	20	20.105	150	150	150	13%
PM_{10} Annual	Dinosaur	0.004	12	12.004	50	50	50	24%
$PM_{2.5}$ 24-hr	Rawah	0.201	10	10.201	65	NA	NA	16%
$PM_{2.5}$ Annual	Dinosaur	0.005	6	6.005	15	NA	NA	40%

Note: Background $PM_{2.5}$ concentration is assumed to be one-half of PM_{10}.

Table 5-4. Comparison of Cumulative Impacts with PSD Class I Increments

Pollutant	Averaging Time	Total Project Impact ($\mu g/m^3$)	PSD Class I Increment ($\mu g/m^3$)	Percentage of Class I Increment ($\mu g/m^3$)
NO_2	Annual	0.763	2.5	31%
SO_2	3-hr	2.886	25	12%
SO_2	24-hr	0.862	5	17%
SO_2	Annual	0.014	2	0.7%
PM_{10}	24-hr	0.105	8	1.3%
PM_{10}	Annual	0.004	4	0.1%

5.3.2.3 Cumulative Visibility Impacts

The effects of cumulative emissions on visibility at the sensitive receptor areas were evaluated using the IWAQM/FLAG recommended method (see Air Quality Technical Report). In this method, visibility degradation resulting from cumulative source emissions was compared against a background visibility based on the mean of the 20 percent cleanest days from a long-term record of the IMPROVE aerosol monitoring data. The background data were previously described in Section 4.2.8. There are two thresholds of visibility change which are used for reporting purposes, the number of days in which the deciview change (delta-deciview or Δ dv) is 0.5 or greater and 1.0 or greater. These thresholds were also discussed in Section 4.2.8.

Table 5-5 presents a summary of the cumulative visibility impact analysis. The analysis indicates that there potentially would be a total of 25 days with greater than 0.5 Δ dv and 7 days with greater than 1.0 Δ dv. Table 5-6 lists the number of days greater than 0.5 and 1.0 Δ dv and the maximum Δ dv for each sensitive area. Note that although there are 25 days listed, the impacts exceed the thresholds in several areas on the same calendar day. There are only 14 different calendar days with impacts in any area over 0.5 Δ dv and 6 different calendar days with impacts over 1.0 Δ dv. The greatest number of days greater than 0.5 Δ dv occurs at the Bridger Wilderness Area. However, the maximum impact of the Desolation Flats Project alone at the Bridger Wilderness area is only 0.079 Δ dv, and that occurred on a different day (April 16, 1995) than the maximum cumulative impact (April 10, 1995). On April 10, 1995, the day of maximum cumulative visibility impact, the Desolation Flats contribution to the cumulative total Δ dv at the Bridger Wilderness Area is zero Δ dv. On average, for the days in which the visibility impact is greater than 1.0 Δ dv, the Desolation Flats project contribution is less than two percent, and for all days where the impact is greater than 0.5 Δ dv, the average Desolation Flats contribution is five percent. In the absence of the Desolation Flats project, cumulative visibility impacts are reduced by two days with greater than 0.5 Δ dv.

Table 5-5. Summary of Cumulative Visibility Impacts

Sensitive Area	Days > 0.5 Δ dv	Days > 1.0 Δ dv	Maximum Δ dv
Bridger Wilderness Area	9	5	2.315
Fitzpatrick Wilderness Area	3	1	1.696
Savage Run Wilderness	2	1	1.377
Popo Agie Wilderness Area	4	0	0.680
Rawah Wilderness	3	0	0.613
Dinosaur National Monument	2	0	0.572
Wind River Roadless Area	1	0	0.826
Mount Zirkel Wilderness	1	0	0.755
Total Visibility Event Days at All Areas	25	7	

Table 5-6. Cumulative Visibility Impacts for All Days Greater Than 0.5 Δ dv

Rank	Sensitive Area	Julian Day	Cumulative Visibility Impact (Δ dv)	Desolation Flats Project Contribution (Δ dv)	Percent Contribution of Desolation Flats Project
1	Bridger Wilderness	100	2.315	0.000	0%
2	Bridger Wilderness	264	1.913	0.000	0%
3	Bridger Wilderness	107	1.794	0.055	3%
4	Fitzpatrick Wilderness	100	1.696	0.000	0%
5	Bridger Wilderness	110	1.442	0.014	1%
6	Savage Run Wilderness	116	1.377	0.115	8%
7	Bridger Wilderness	86	1.334	0.000	0%
8	Bridger Wilderness	85	0.985	0.000	0%
9	Fitzpatrick Wilderness	146	0.873	0.008	1%
10	Wind River Roadless Area	110	0.826	0.015	2%
11	Mount Zirkel Wilderness	116	0.755	0.093	12%
12	Bridger Wilderness	124	0.752	0.004	1%
13	Fitzpatrick Wilderness	124	0.716	0.000	0%
14	Popo Agie Wilderness	146	0.680	0.018	3%
15	Bridger Wilderness	146	0.660	0.016	2%
16	Rawah Wilderness	116	0.613	0.076	12%
17	Rawah Wilderness	113	0.611	0.000	0%
18	Bridger Wilderness	106	0.606	0.079	13%
19	Popo Agie Wilderness	106	0.582	0.073	13%
20	Savage Run Wilderness	263	0.573	0.031	5%
21	Dinosaur National Monument	355	0.572	0.144	25%
22	Dinosaur National Monument	85	0.539	0.003	1%
23	Rawah Wilderness	263	0.536	0.043	8%
24	Popo Agie Wilderness	110	0.532	0.013	2%
25	Popo Agie Wilderness	61	0.512	0.006	1%

5.3.2.4 Cumulative Acid Deposition Impacts

The potential impacts of cumulative emission sources on acid deposition were analyzed using the Fox (1989) method (see Air Quality Technical Report). This method was used to estimate the potential change in acid neutralizing capacity (ANC) at each of 12 sensitive lakes. The cumulative potential impacts resulting from acid deposition are summarized in Table 5-7. The predicted change in sensitive lake ANC levels resulting from cumulative source acid deposition were found to be far below the levels of acceptable change.

Table 5-7. Summary of Potential Cumulative Acid Deposition Impacts

Sensitive Lake	Sensitive Area	Monitored Background ANC (μeq/l)	Level of Acceptable Change	Change In ANC (μeq/l)	Percentage of LAC
Black Joe Lake	Bridger Wilderness	69.0	10% (6.9 μeq/l)	0.246	3.56%
Deep Lake	Bridger Wilderness	61.0	10% (6.1 μeq/l)	0.256	4.19%
Hobbs Lake	Bridger Wilderness	68.0	10% (6.8 μeq/l)	0.133	1.95%
Upper Frozen Lake	Bridger Wilderness	5.7	1 μeq/l	0.271	27.1%
Ross Lake	Fitzpatrick Wilderness	61.4	10% (6.1 μeq/l)	0.073	1.19%
Lower Saddlebag	Popo Agie Wilderness	55.5	10% (5.6 μeq/l)	0.292	5.27%
Pothole A-8	Mount Zirkel Wilderness	16.0	1 μeq/l	0.194	19.4%
Seven Lakes	Mount Zirkel Wilderness	35.5	10% (3.6 μeq/l)	0.279	7.85%
Upper Slide Lake	Mount Zirkel Wilderness	24.7	1 μeq/l	0.199	19.9%
West Glacier Lake	Medicine Bow Wilderness	26.1	10% (2.6 μeq/l)	0.377	14.4%
Island Lake	Rawah Wilderness	64.6	10% (6.5 μeq/l)	0.218	3.37%
Rawah #4 Lake	Rawah Wilderness	41.2	10% (4.1 μeq/l)	0.236	5.72%

5.3.2.5 Discussion of Significance

The cumulative impact analysis predicts that the maximum criteria pollutant concentrations will not exceed federal or state ambient air quality standards. In addition, cumulative impacts are predicted to be less than the PSD Class I increments. Potential impacts to sensitive lake ANC are less than the applicable limits of acceptable change.

Visibility impacts of up to 25 days exceeding the 0.5 Δ dv threshold are predicted as a result of cumulative emissions. However, the presence or absence of the Desolation Flats Project does not significantly change the cumulative visibility impact. On only two of the 25 days would the absence of Desolation Flats change the visibility impacts to levels below the thresholds, and these are only for days slightly over 0.5 Δ dv. None of the Δ dv days over 1.0 would be changed to below the 1.0 threshold with the absence of the Desolation Flats project. Of the two days that Desolation Flats would contribute to 0.5 Δ dv impacts, one occurs at Dinosaur National Monument while the second occurs at Rawah Wilderness.

5.3.3 Soils

The CIA area for soils includes the DFPA and the Barrel Springs Draw and Sand Creek drainage basins. Cumulative impacts include soil impacts from ongoing activities, recently constructed projects and RFFA's.

Desolation Flats Project Area. Existing and cumulative disturbances within the DFPA are described in section 5.2.1.1 for the Proposed Action and for Alternative A. Under Alternative B (No-Action) additional surface disturbance would occur on a case-by-case basis. For both action alternatives, the cumulative post-reclamation disturbances are relatively low, (1.6 percent for the Proposed Action and 2.1 percent for Alternative A) and the successful implementation of erosion, runoff, sediment control and revegetation measures described in Section 2.5.2.11.2, Section 4.5.5 and Appendix C would minimize the contribution of the Proposed Action and alternatives to cumulative impacts on soil resources. No additional RFFA's are anticipated for the DFPA, therefore, cumulative impacts on soils within the DFPA would be similar to those described in Section 4.3.

Watershed CIA Area. Cumulative disturbances within the Barrel Springs Draw and Sand Creek drainage basins are estimated at 0.89 percent of the total watershed CIA area (see Section 5.2.3.1). The successful implementation of erosion, runoff, sediment control and revegetation measures would also minimize the contribution of the Proposed Action and alternatives to cumulative impacts on soil resources within these drainage basins.

5.3.4 Water Resources

Cumulative impacts include water resource impacts from ongoing activities, recently constructed projects, and projects likely to be implemented in the near future. Cumulative impacts are assessed for the DFPA and the watershed CIA area which includes the Sand Creek and Barrel Springs Draw drainage areas.

Desolation Flats Project Area. Existing and cumulative disturbances within the DFPA are described in section 5.2.1.1 for the Proposed Action and for Alternative A. Under Alternative B (No-Action) additional surface disturbance would occur on a case-by-case basis. Cumulative post-reclamation disturbances (1.6 percent for the Proposed Action and 2.1 percent for Alternative A) would not significantly impact surface water and groundwater quantity and quality for the reasons discussed under Section 4.4.3.1.

Watershed CIA Area. The total existing and future disturbance in the Barrel Springs Draw and Sand Creek watershed CIA (including the DFPA and portions of the Creston/Blue Gap, Continental Divide/Wamsutter II, and South Baggs project areas) was estimated at approximately 5,220 acres, or 0.89 percent of the CIA (this disturbance estimate takes reclamation and future disturbance into consideration). This cumulative disturbance would not significantly impact surface water and groundwater quantity and quality for the reasons discussed under Section 4.4.3.1. Further, sediment input into the Little Snake River would be negligible.

No serious groundwater pollution problems have been detected in the watershed CIA area. Current oil and gas exploration and development activities must comply with federal and state environmental quality laws and thus, serious water quality and quantity impacts are not expected on a cumulative scale. Section 3.4.3.1 identified current water usage in the general area of the

Desolation Flats project to be approximately 90,000 ac-ft per year for all combined surface water and groundwater sources and uses (Collentine et al. 1981). This estimate includes uses outside the watershed CIA area. Using this estimate as an environmentally conservative indication of total existing water usage, the Desolation Flats project under Alternative A (844.2 ac-ft total) and approximately 27 percent of the Creston/Blue Gap project (714 ac-ft), 15 percent of the Continental Divide/Wamsutter II project (1047ac-ft), and 21 percent of the South Baggs project (32 ac-ft) total water usage within the CIA area could be as high as 2,637 ac-ft., or approximately 3 percent of current water usage in the general area of the Desolation Flats project. This cumulative water usage is relatively small and a relatively minor portion of total surface water and groundwater yield/availability. Therefore, cumulative impacts on surface water and groundwater quantity would not be significant.

5.3.5 Vegetation and Wetlands

The CIA area for vegetation and wetlands resources includes both the DFPA and the Barrel Springs Draw and Sand Creek watershed CIA area.

<u>Desolation Flats Project Area</u>. The Proposed Action and alternatives are the only RFFA's likely to occur in the DFPA. The relatively small percentage of cumulative post-reclamation disturbance in the DFPA) (1.6 percent for the Proposed Action and 2.1 percent for Alternative A, see Section 5.2.1.1), coupled with successful implementation of the impact avoidance and mitigation measures outlined in Section 2.2.2.11.2, Section 4.5.5 and Appendix C would result in cumulative vegetation and wetland impacts within the DFPA below the significance thresholds established for this analysis.

<u>Watershed CIA Area</u>. Cumulative disturbances within the watershed CIA are estimated at 0.89 percent. Successful implementation of soils, surface water and vegetation mitigation measures would minimize the contribution of the Proposed Action and alternatives to cumulative vegetation impacts within the watershed CIA.

Although waters of the U.S. comprise less than one percent of the project area, any unpermitted impact to these waters associated with this project or other projects in the vicinity or region would add to the cumulative loss of these important areas. The historical loss of wetlands in the U.S. has been well documented as a major environmental problem; the majority of disturbance is due to agricultural diversion, urban development, and other causes (including industrial development and transportation). There has also been significant historical loss of wetlands in Wyoming. A COE-approved Section 404 permit with requirements of avoidance of waters of the U.S., including special aquatic sites and wetlands, and measures prescribed in Chapter 2, Section 4.5.5 and Appendix C would remove the potential for significant cumulative impacts to these sensitive areas.

5.3.6 Range Resources and Other Land Uses

The CIA area for range resources and other land use is the project site and immediately adjacent lands, including grazing allotments whose boundaries include portions of the DFPA and the Continental Divide/Wamsutter II or Creston/Blue Gap project areas.

<u>Desolation Flats Project Area</u>. Historic and existing land use on the project area includes grazing, dispersed recreation and oil and gas exploration, development and transmission. The Proposed Action and alternatives are the only RFFA within the DFPA, consequently cumulative impacts on

range resources and other land use within the DFPA are anticipated to be similar to those associated with the Proposed Action or alternatives.

Adjacent Areas. Several grazing allotments affected by the Desolation Flats project would also be affected by the Continental Divide/Wamsutter II and/or Creston/Blue Gap projects. Grazing allotments that occupy portions of several oil and gas project areas (e.g., Rock Springs, East Muddy, South Barrel, Flat Top Section Red Creek, Willow Creek, North Barrel I, South La Clede) could receive cumulative impacts from loss of forage associated with disturbance, which would occur if operators in several natural gas project areas simultaneously develop wells, roads and/or ancillary facilities within a particular grazing allotment. The potential for such occurrences cannot be predicted, because the timing and location of development in a particular area is uncertain. Increased traffic and field development activity in theses cases would also provide greater opportunities for conflict with grazing operations. Cumulative impacts in these cases would be greater during drilling and field development and recede substantially once wells are put into production and pipeline disturbances and portions of well pad and ancillary facility disturbances are reclaimed. Long-term cumulative impacts to grazing are anticipated to be minimal. The development of new roads within allotments may be beneficial in that they may allow grazing operators better access to the allotments.

5.3.7 Wildlife

The CIA areas for wildlife resources differ with respect to species. This analysis examines the proportion of the wildlife habitat within respective CIA areas that may be disturbed from all past, present, and reasonably foreseeable future activities. Long-term disturbance, as a result of the Proposed Action, totals 2,139 acres. It was assumed that 4 well locations may be developed per section within the DFPA. However, the specific sections that would be disturbed are not currently known. Likewise, in assessing cumulative impacts, it was not possible to specifically determine where future impacts would occur within CIA areas. Therefore, estimates of total disturbance were made based upon the location of past, present, and future projects (Section 5.2.2) within the CIA areas and the expected amount of disturbance associated with each project. The proportion of the estimated total disturbance within the CIA areas was used to estimate the cumulative area of wildlife habitats that may be disturbed by past, present, and RFFA's. This analysis represents the most current and accurate estimate of cumulative impacts available at this time.

The potential for significant cumulative impacts to commonly occurring wildlife species (numerous small mammal and song bird species) is low. Monitoring of wildlife populations, and the distribution of disturbances within the CIA areas, as identified in the Wildlife Monitoring/Protection Plan (Appendix H), would allow the BLM to determine if additional mitigation measures are needed to avoid significant cumulative impacts.

5.3.7.1 Big Game

Three big game species: pronghorn antelope (*Antilocapra americana*), mule deer (*Odocoileus hemionus*) and elk (*Cervus elaphus*) occur in significant numbers within the DFPA. Big game populations are managed within herd units designated for each species and cumulative impacts are discussed in the context of these areas (Figures 3-10 to 3-12). Cumulative big game habitat losses for pronghorn, mule deer, and elk herds resulting from development of the DFPA are presented in Table 5-8. These potential habitat loses include estimated disturbances associated with the actions described in Section 5.2.2 that impact the respective herd units, existing impacts, and RFFA. Monitoring of development activities and associated impacts to big game species as

identified in the Wildlife Monitoring/Protection Plan (Appendix H) would allow the BLM to identify whether additional mitigation measures, or further study to make such determinations, are necessary within the DFPA.

Implementation of the proposed project on the DFPA would likely affect crucial winter/yearlong and winter/yearlong range for all three big game species. The specific locations of disturbances are not known, therefore the proportions of each type of seasonal big game ranges that may be impacted are unknown. Therefore, the potential impacts to big game habitats are estimated for the portions of each herd unit that contains designated big game seasonal ranges. The cumulative disturbance to big game seasonal ranges expected to result from development activities from the combination of existing, proposed, and reasonably foreseeable future surface disturbances within each of the three big game herd units are listed in Table 5-8. Cumulative impacts to big game will include surface disturbance of habitat, but may also include such factors as increased stress due to human/wildlife encounters, potential impacts upon birth/survival rates, and possible impacts upon migration routes.

Pronghorn. Development within the DFPA under the Proposed Action would disturb a total of 2,139 acres of crucial winter/yearlong and/or winter/yearlong pronghorn habitat within the Bitter Creek Pronghorn Herd Unit. Cumulative long term surface disturbance of these seasonal ranges resulting from existing, proposed, and potential future developments within the Bitter Creek Pronghorn Herd Unit is approximately 23,088 acres (1.2% of the herd unit) under the Proposed Action (Table 5-8) and 24,249 acres (1.3% of the herd unit) under Alternative A. The population objective for the Bitter Creek Herd Unit is 25,000 animals, and cumulative impacts to pronghorn seasonal ranges within the Bitter Creek Herd Unit are not expected to significantly reduce herd unit carrying capacity. Cumulative impacts upon pronghorn migration routes within the Bitter Creek Herd Unit are expected to be minimal because no large-scale linear barriers (e.g. fences) would be constructed as a result of the Proposed Action.

Table 5-8. Estimated Cumulative Surface Disturbance (acres) within Big Game Seasonal Ranges and Wild Horse Herd Management Areas, Included within the DFPA.

		Project Related Development		Cumulative Development[1]		Total Disturbance	
	Acreage Available	Initial	LOP	Existing	Potential Future	Acres	%
Pronghorn - Bitter Creek Herd Unit							
	1,836,948	4,923	2,139	10,828	10,121	23,088	1.2
Mule Deer - Baggs Herd Unit							
	1,657,349	4,923	2,139	22,932	15,612	40,683	2.4
Elk - Petition Herd Unit							
	382,545	487	295	149	174	618	0.2
Wild Horses - Adobe Town Herd Management Area							
	466,265	4,091	1,777	2,000	600	4,377	0.9

1 - Source CD/WII EIS (USDI-BLM 1999a)

Mule Deer. Development within the DFPA under the Proposed Action would disturb a total of 2,139 acres of crucial winter/yearlong and/or winter/yearlong mule deer habitat within the Baggs Mule Deer Herd Unit. Cumulative long term surface disturbance of these seasonal ranges resulting from existing, proposed, and potential future developments within the Baggs Herd Unit is approximately 40,683 acres (1.9% of the herd unit) under the Proposed Action (Table 5-8) and 41,844 acres (2.0% of the herd unit) under Alternative A. The population objective for the Baggs Herd Unit is 18,700 animals, and cumulative impacts to mule deer seasonal ranges within the Baggs Herd Unit are not expected to significantly reduce herd unit carrying capacity. Cumulative impacts upon mule deer migration routes within the Bitter Creek Herd Unit are expected to be minimal because no large-scale linear barriers (e.g. fences) would be constructed as a result of the Proposed Action.

Elk. A small proportion (20.8%) of the Petition Elk Herd Unit actually contains designated elk seasonal ranges. Therefore, only those projects that impact habitat in designated seasonal ranges would contribute to cumulative impacts to elk ranges. Development within the DFPA under the Proposed Action would disturb approximately 295 acres of crucial winter/yearlong and/or winter/yearlong elk habitat within the Petition Elk Herd Unit. Cumulative long term surface disturbance of these elk seasonal ranges resulting from existing, proposed, and potential future developments within the Petition Elk Herd Unit would be approximately 618 acres (0.16% of the elk seasonal ranges in the Petition Herd Unit) under the Proposed Action (Table 5-8) and 778 acres (0.2% of the elk seasonal ranges in the Petition Herd Unit) under Alternative A. The population objective for the Petition Herd Unit is 300 animals, and the estimated cumulative impacts to elk seasonal ranges are not expected to significantly reduce the carrying capacity of the Petition Herd Unit. Cumulative impacts upon elk migration routes within the Petition Herd Unit are expected to be minimal because no large-scale linear barriers (e.g. fences) would be constructed as a result of the Proposed Action.

Big Game Summary. Overall, cumulative direct disturbances to big game habitat are expected to be small within all of the herd units and thus, do not indicate a likelihood for significant impacts to pronghorn, mule deer, or elk from implementation of this project. Cumulative indirect disturbance (e.g., displacement) would likely be similar to that discussed under the Proposed Action (i.e., not significant). The degree of big game displacement would be related to the amount of drilling activity occurring at any one time. As drilling is completed and human activity is reduced, the amount of displacement would be reduced and over time big game animals would adapt to well pad facilities. Potential for long-term displacement would likely be related to the amount of human activity required for maintenance. Increased human activities and accessability within the DFPA may influence or impede big game migrations through the area to a limited extent. However, no linear barriers (e.g. fences) would be constructed that would prevent big game migrations, therefore, impacts to big game migration routes from implementation of the Proposed Action are not anticipated to be significant. In summary, implementation of the Proposed Action is not expected to cause significant cumulative impacts to any of the big game herds within the DFPA.

5.3.7.2 Wild Horses

Approximately 1,740 wild horses resided within the Adobe Town Wild Horse HMA in 2001 (Reed 2002), and 179 in areas of other wild horse habitat outside of the Wild Horse HMA (Reed 2002, Figure 3-13). The cumulative impact analysis for wild horses resulting from ground disturbance associated with development of the DFPA is presented for that portion of the Adobe Town Wild Horse HMA encompassed by the DFPA (Table 5-8 and Figure 3-13). Within this area, existing,

proposed, and potential future developments would result in increased habitat loss and indirect disturbance or displacement; however, overall range conditions within the DFPA are not anticipated to decline as a result of the proposed and future development activities. Development of the DFPA under the Proposed Action is expected to result in approximately 1,777 acres (0.4%) of additional surface disturbance within the Wild Horse HMA in the long term. The cumulative long term surface disturbance resulting from existing, proposed, and potential future developments within the Adobe Town Wild Horse HMA is approximately 4,377 acres (0.9%) under the Proposed Action (Table 5-8), and increases only slightly to 5,342 acres (1.1%) under Alternative A.

Currently, wild horse numbers in the Adobe Town Wild Horse HMA are above the management objective. One management goal for wild horses is to maintain wild, free-roaming populations (Reed 2002). Increased human activity over the long-term may potentially influence the "wild" behavior of horses as they become more acclimated to human presence and activity. At this time it is not known what impacts the long-term activity within a natural gas field may have upon the behavioral patterns of wild horses. The short-term displacement of some horses utilizing areas near wells pads or roads may result in increased pressure on sensitive resource areas such as springs and water holes. However, development may result in new areas that horses may be attracted to. These areas may include new water impoundments and new vegetation on reclaimed areas. In these instances, horse use of naturally occurring sensitive areas such as springs may be reduced. It is not known how horse distribution patterns on the Adobe Town Wild Horse HMA may change as a result of development on the DFPA. The loss of habitat and disturbance to horse herds in the Adobe Town Wild Horse HMA due to the project implementation are not anticipated to result in significant cumulative impacts to wild horses.

5.3.7.3 Greater Sage-grouse

Greater sage-grouse inhabit the DFPA year-round and require a wide range of seasonal habitats. The Bitter Creek Upland Game Bird Management Area is the CIA area for greater sage-grouse breeding and nesting habitats (Figure 5-3). Surveys conducted for this project identified and inventoried greater sage-grouse severe winter relief habitat. A total of 209 acres of greater sage-grouse severe winter relief habitat was identified during the surveys and disturbance in these areas would be avoided (Figure 3-14). Severe winter relief habitat within the remainder of the Bitter Creek UGBMA has not been identified.

The area of potential nesting habitat consists of a 2-mile buffer placed around all active and historic leks within the Bitter Creek UGBMA. However, not all habitat within the 2-mile buffer around leks will be suitable nesting habitat. It is estimated that approximately 7,885 (3.1%) acres of potential nesting habitat may be disturbed within the Bitter Creek UGBMA by past, present, and reasonably foreseeable future activities (Table 5-9). Cumulative disturbances resulting from past, present, and reasonably foreseeable future developments within greater sage-grouse nesting habitat increase only slightly to 8,156 acres (3.2%) under Alternative A. The projected disturbance is a conservative calculation that likely overestimates the collective disturbance area and the resultant cumulative impacts to greater sage-grouse nesting habitat within the Bitter Creek UGBMA. The reason for this overestimation is that all known historic and active leks (Figure 5-3) were included in the disturbance area calculations, rather than only those leks known to be currently active.

The cumulative area of disturbance to greater sage-grouse leks would not increase above the area that has been disturbed from past actions, because the BLM would not allow development within 0.25 miles of active greater sage-grouse leks. Implementation of mitigation measures for greater sage-grouse identified in Chapters 2 and 4 would ensure that overall impacts to greater sage-

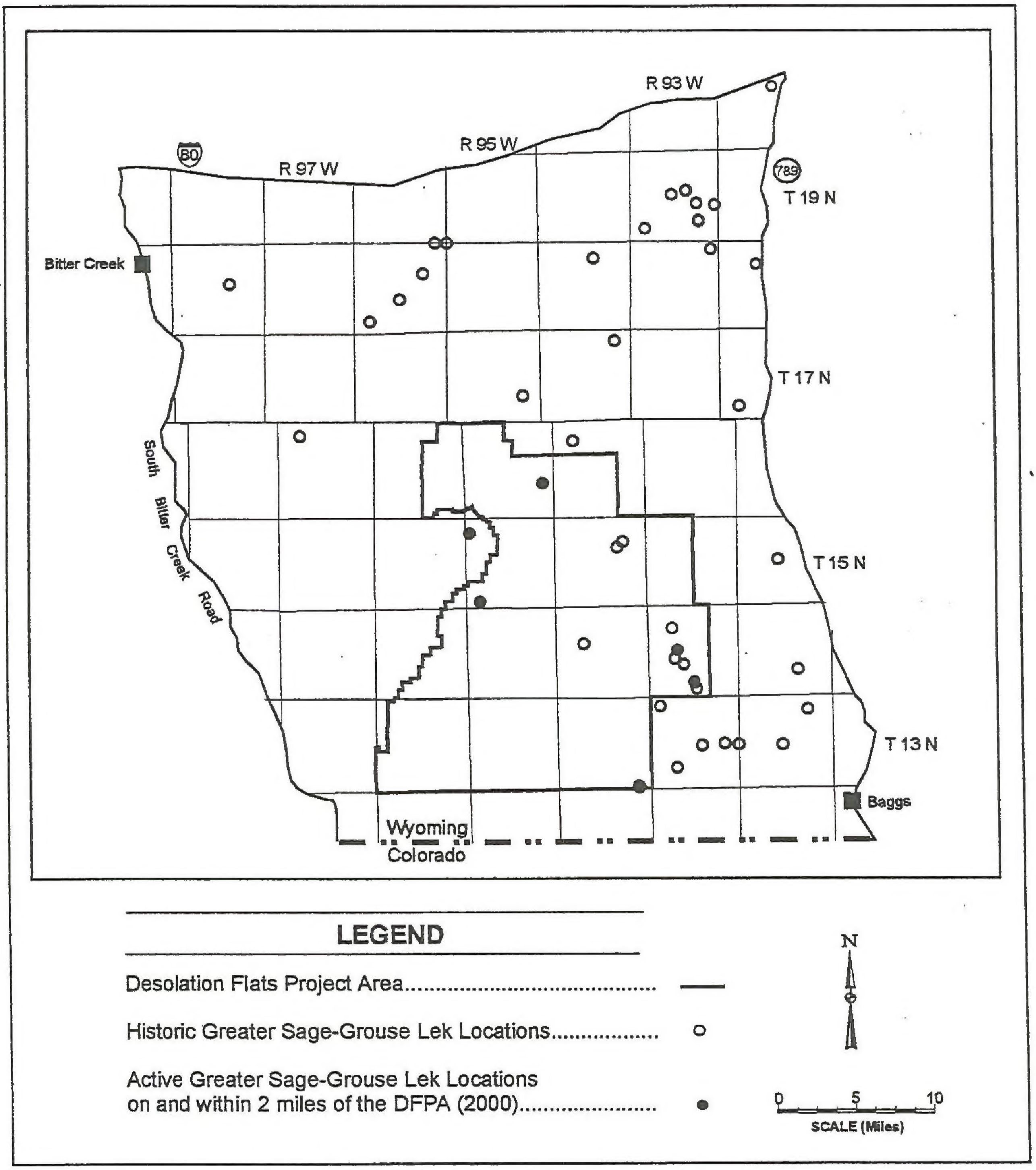


Figure 5-3. Active Greater Sage-Grouse Lek Locations within the DFPA Survey Area and other Historic Lek Locations within the Bitter Creek Upland Game Bird Management Area.

grouse populations within the DFPA are low. The APD process provides an additional opportunity for BLM biologists to review the status of leks relative to project activities and determine necessary courses of action to ensure that no significant cumulative impacts to greater sage-grouse leks, nesting habitat, and severe winter relief habitat, occur within the Bitter Creek UGBMA.

5.3.7.4 Raptors

For the sake of consistency, the Minerals CIA area from the CD/WII EIS (USDI-BLM 1999a), plus that portion of the DFPA not previously included (29.7% of the DFPA) in that area, was used as the CIA area for raptors in this analysis. This area plus a 1-mile buffer covers approximately 2,374,625 acres.

Table 5-9. Cumulative Acreage of Surface Disturbance within the CIA Areas for Raptors and Greater Sage-grouse within the DFPA.

		Project Related Development		Cumulative Development[1]		Total Disturbance	
Species/ Habitat	Acreage Available	Initial	LOP	Existing	Potential Future	Acres	%
Greater Sage-grouse - Bitter Creek UGBMA							
Potential nesting	252,097	1,183	515	4,470	2,900	7,885	3.1
Potential breeding	5,359	0	0	500	0	500	9.3
Raptors - Cumulative Impacts Analysis Area							
Potential foraging	2,374,625	4,923	2,139	56,600	24,900	83,639	3.5
Potential nesting	2,096,231	2,360	1,024	19,640	11,300	31,964	1.5

1 - Source CD/WII EIS (USDI-BLM 1999a)

<u>Nests</u>. Development of the Proposed Action may result in the disturbance of 1,024 acres of potential raptor nesting areas within the DFPA over the LOP. It is estimated that collectively, approximately 31,964 acres (1.5%) of potential raptor nesting habitat may be disturbed by past, present, and reasonably foreseeable future activities (Table 5-9) under the Proposed Action. The cumulative impact would increase to approximately 32,520 acres (1.6%) under Alternative A. This analysis is conservative and likely overestimates the area of disturbance and the cumulative impacts resulting from mineral development in this area. Three main reasons account for this overestimation: (1) some of the nests within the 1-mile zone surrounding the CIA area would not end up being within 1 mile of wells drilled within the project area, (2) all nests within the CIA area were used in the analysis instead of just nests that were known to have been active during recent years, and (3) some wells would be located less than 1 mile from nests in areas where topography interrupts the line-of-sight between nests and wells. Making efforts to locate wells outside the line-of-sight of raptor nests would contribute substantially to reducing potential cumulative impacts.

Forage Habitats. All of the CIA area was assumed to be suitable raptor foraging habitat. The cumulative area of raptor foraging habitat potentially affected within the CIA would be approximately 83,639 acres (3.5% of the CIA) under the Proposed Action (Table 5-9), and 84,800 acres (3.6% of the CIA) under Alternative A. This level of cumulative impact to raptor foraging habitat is not expected to significantly reduce the available prey base.

Although the total number of raptor nests and the acreage of foraging habitat within the CIA area that are subject to potential impacts would increase with the implementation of either the Proposed Action or Alternative A, the application of: (1) existing BLM stipulations, (2) the mitigation and avoidance measures prescribed elsewhere in this EIS, and (3) the monitoring measures set forth in the Wildlife Monitoring/Protection Plan (Appendix H), are expected to protect the raptor populations within the CIA area, and significant cumulative impacts are not expected.

5.3.8 Special Status Plant, Wildlife, and Fish Species

5.3.8.1 Threatened, Endangered, and Sensitive Wildlife Species

The CIA area for threatened, endangered, and sensitive species was considered to include the Minerals CIA area used in the CD/WII EIS (USDI-BLM 1999a) plus that portion of the DFPA not previously included in that area. Potential impacts to threatened, endangered, proposed and sensitive species in this area of Wyoming are likely to be primarily associated with minerals development (see Section 5.2.2). Implementation of the Proposed Action or Alternative A would extend the area over which potential development impacts could occur, and adverse cumulative impacts to special status species could occur if development precludes use of large areas by these species. However, the application of monitoring (Wildlife Monitoring/Protection Plan for this project; Appendix H) and mitigation measures associated with each of the projects within the CIA area is expected to provide adequate protection for threatened, endangered, proposed, and sensitive species from past, present and potential future actions. These monitoring and mitigation measures have been developed through a collaborative effort among the Operators, BLM, FWS, WGFD, and other concerned parties. Through these efforts, cumulative impacts to special status wildlife species are not expected to be significant.

5.3.8.2 Threatened, Endangered, and Sensitive Fish Species

Currently, no threatened, endangered, or proposed fish species are known to exist in the DFPA, although occurrences of some of these species have been documented downstream from the DFPA (Baxter and Stone 1995). Development within the DFPA may have the potential to influence the quantity/quality of water that enters rivers downstream of the DFPA. The CIA area for threatened, endangered, and sensitive fish species is considered to be a combination of the Muddy Creek and Northwest Little Snake River (Sand Creek) watersheds (Figure 5-4). Both of these watersheds drain into the Little Snake River.

A total of 203,789 acres (87.2%) of the DFPA lies within the Northwest Little Snake River watershed, with the remaining 29,753 acres (12.8%) in the Muddy Creek watershed. Table 5-10 presents the total existing, proposed, and potential future surface disturbances expected to result from currently approved development activities (Section 5.2.2) within the two watersheds. The CIA area includes portions of Creston/Blue Gap, Continental Divide/Wamsutter, Greater Wamsutter II,

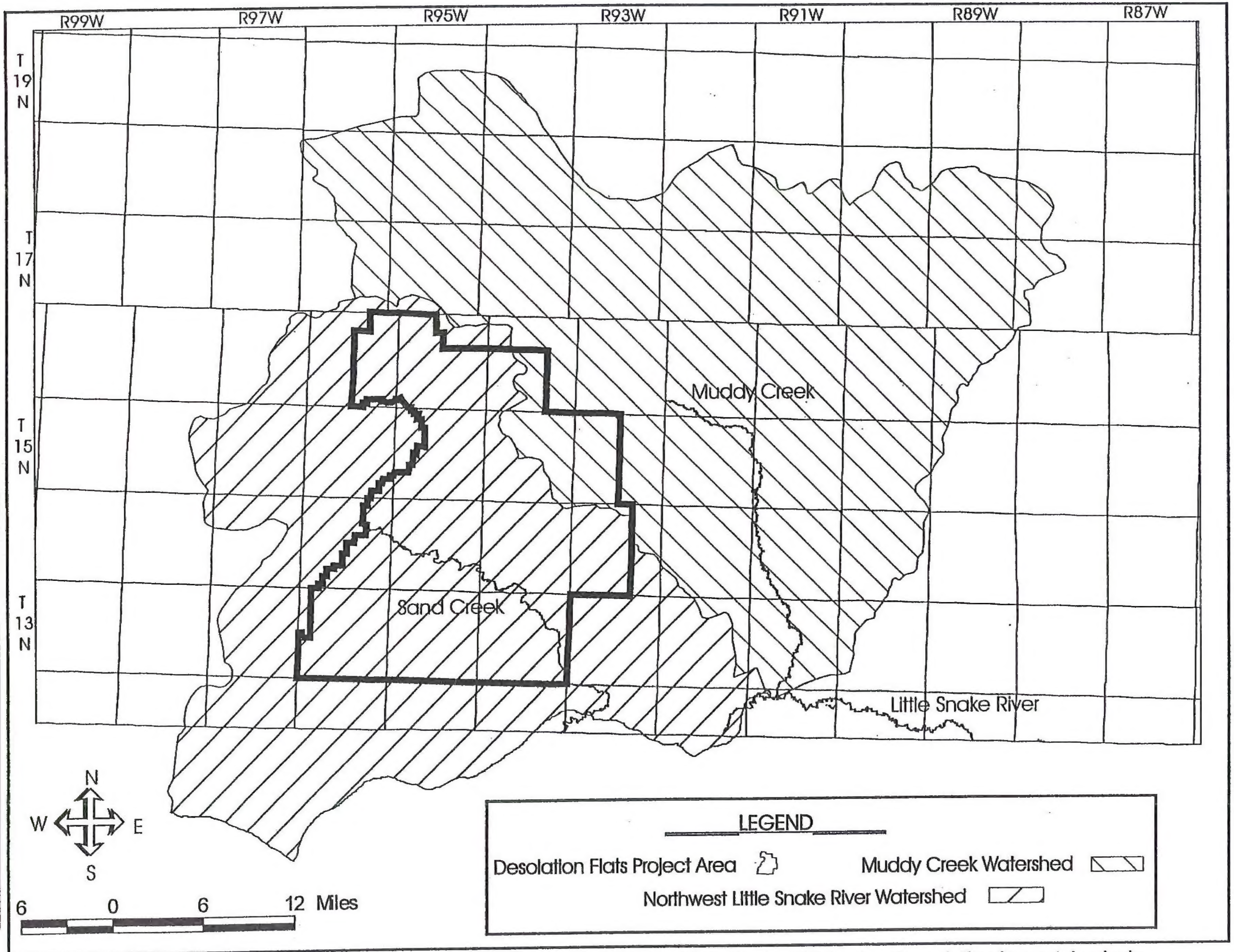


Figure 5-4 Watershed Boundaries and Major Drainages for the Desolation Flats Project Fisheries Cumulative Impact Analysis.

and Mulligan Draw study areas. Cumulative impacts that result from all actions within the CIA area would be approximately 19,609 acres (1.7% of the CIA area) (Table 5-10) with implementation of the Proposed Action. Cumulative impacts that result from all actions within the CIA area would be approximately 20,770 acres (1.8% of the CIA area) with implementation of Alternative A. These proposed disturbances would affect a total of 15.25 miles of potential fish bearing streams within the DFPA.

If special status fish species are excluded from critical habitats, or if those habitats are degraded as a result of cumulative impacts within the CIA area, significant impacts to these species may occur. However, all permitted disturbances associated with the Desolation Flats project and other development within the CIA area would employ erosion control measures and construction techniques suitable to limit offsite soil movement and downstream degradation of fisheries habitat. The mitigation and avoidance measures set forth in this EIS to protect fisheries resources are likely be adequate to protect surface waters and special status fish species. Thus, the overall cumulative impacts to fish species found within the affected watersheds, and downstream watersheds, are not expected to be significant.

5.3.8.3 Threatened, Endangered, and Sensitive Plant Species

Suitable habitat for the Ute ladies'-tresses is not present on the DFPA, therefore implementation of the proposed project would not contribute to cumulative impacts upon this species. No significant cumulative impacts would occur to sensitive plant species or their habitat within the CIA area upon implementation of mitigation measures in this document.

Table 5-10. Acreage of Project Related and Cumulative Surface Disturbance within Affected Watersheds of the DFPA.

		Project Related Development		Cumulative Development		Total Disturbance	
Watershed	Acreage Available	Initial	LOP	Existing	Potential Future	Acres	%
Muddy Creek	656,414	630	274	7,500	4,200	11,974	1.8
Northwest Little Snake	527,767	4,293	1,865	4,370	1,400	7,635	1.4
Total	1,184,181	4,923	2,139	11,870	5,600	19,609	1.7

5.3.9 Recreation Resources

The CIA area for recreation resources includes the project site and adjacent areas in southeastern Sweetwater County and southwestern Carbon County. The DFPA would add to the substantial level of impact to the recreation resource already existing in the region. The Proposed Action and alternatives, in conjunction with the projects listed in Section 5.2.2, limit the ability of hunters and non-consumptive recreationists to adapt to changing patterns of wildlife use of the landscape, find more pristine environments, and relocate their activities in nearby areas. Disturbance in 23 square miles of the existing MVMA, an important area for recreationists seeking solitude and isolation,

would substantially reduce relocation options. These conditions increase the probability that hunters and other recreationists would be displaced, dissatisfied, or have a less enjoyable recreation experience.

5.3.10 Visual Resources

The CIA area for visual resources includes the project site and adjacent areas in southwestern Sweetwater County and southeastern Carbon County. The proposed action would add to the substantial level of impact to visual resources in the immediate area associated with historic and ongoing oil and natural gas development (see Section 5.2.2). Although these projects are in different viewsheds, the composite experience of those traveling through the area, particularly on back roads, is one of a highly modified landscape. Contrasts in line, form, color and texture begin to dominate the viewers experience. Views of large, relatively undisturbed patches of the characteristic Wyoming Red Desert landscape are becoming less common. These conditions would increase the likelihood that viewers, particularly back country recreationists, would be dissatisfied with the visual component of their recreation experience.

5.3.11 Cultural Resources

The CIA area for cultural resources is the project area and adjacent areas in southeastern Sweetwater County and southwestern Carbon County. No RFFA's which would disturb cultural resources in the project area are anticipated. Therefore, cumulative impacts to cultural resources would be similar to those described in Section 4.11.

5.3.12 Socioeconomic Resources

The CIA area for socioeconomic conditions includes Sweetwater and Carbon counties, and the communities of Rock Springs, Wamsutter, Rawlins and Baggs. Although Sweetwater and Carbon counties contain an abundance of oil, coal, uranium, trona and other resources, the current potential for cumulative socioeconomic effects in the CIA area is associated with the natural gas development activities listed in Section 5.2.2. Natural gas development has been ongoing for some time in Sweetwater and Carbon counties, but the pace of drilling and field development has recently accelerated in response to anticipated demand. The continued pace and duration of natural gas development in the Sweetwater and Carbon counties and the corresponding level of economic and population growth will depend in large part on future natural gas demand and prices.

Assuming historic (through 2001) cyclic levels of natural gas development, potential cumulative impacts on area socioeconomic conditions would include positive effects on local economic conditions, increased employment opportunities associated with the projects listed in Section 5.2.2, increased demand on housing resources and community services from in-migrating employees and families associated with the projects, and increased federal, state and local tax revenues generated from project infrastructure development and production. Cumulative development in the CIA also holds potential to affect local attitudes, opinions and lifestyles.

As discussed in Section 4.12, the current trend is for gas service firms and their employees to locate in Rock Springs and, to a lesser extent, Rawlins. Population levels in Sweetwater and Carbon counties and the communities of Rock Springs and Rawlins are below their peak population levels of the 1980's. Much of the infrastructure in these communities has been sized to accommodate higher levels of population therefore, significant cumulative impacts on services in these communities would not be anticipated, although strains on particular services could occur.

There are existing apartments and underutilized mobile home parks and motels which could serve as temporary accommodations for drilling and field development workers (Rawlins Daily Times 2000).

The communities of Wamsutter and Baggs may receive substantially higher percentages of growth (relative to their size) in response to cumulative natural gas development activities. The Wamsutter area in particular is experiencing population growth in response to British Petroleum's plans to drill approximately 200 wells per year over the next four years and 75 wells per year for the next ten years (Rawlins Daily Times 2000). Anadarko Petroleum also plans to drill 30 wells in the Wamsutter area in 2001 and several other companies have increased their drilling efforts in that area. BLM RFO officials anticipate that up to 300 wells per year could be drilled in the Wamsutter area over the next several years (Rock Springs Rocket Miner 2001b). An influx of oil and gas service workers will be required to achieve these drilling and field development levels.

Wamsutter has recently added some housing resources to accommodate growth from these activities, but area landlords and developers are reluctant to initiate large-scale housing development because of the "boom and bust" history of the town (Carnes 2002, Waldner 2002). Given the limited housing resources in Wamsutter (see Section 3.12.4), natural gas service workers are likely to seek housing accommodations in other communities. If a substantial number of new housing resources become available in Wamsutter, population growth from the Proposed Action or alternatives or from other area natural gas development would exacerbate the existing community services demand in the town.

The proximity of Baggs to the southern gas fields means that the town would receive growth pressure from cumulative natural gas development. As with Wamsutter, few housing resources are currently available in Baggs. If substantial housing is developed in response to cumulative demand, community infrastructure could be strained.

The cumulative economic effects of natural gas development in the CIA would be positive and substantial, for Sweetwater and Carbon counties, the State of Wyoming and the nation as a whole. The cumulative fiscal effects associated with natural gas development in the area would also be substantially positive. Sustained high natural gas prices coupled with increased production would provide substantial severance tax and mineral royalty revenues for the State of Wyoming and substantial property tax revenues for Carbon and Sweetwater counties and certain special districts. Natural gas-related property tax revenues would also flow to school districts, although the mechanisms of the Wyoming School Foundation funding formula may result in little or no net gain in revenues for local schools.

Municipalities receive sales and use tax revenues, but do not receive property tax revenues from natural gas development. The amount of sales and use tax revenues that small communities receive from natural gas development is correspondingly small. Therefore communities such as Wamsutter and Baggs would not have revenues from this source to expand municipal infrastructure in response to cumulative natural gas development-related growth.

The effects of cumulative natural gas development activities on local attitudes, opinions and lifestyles is likely to be mixed. Natural gas development in Sweetwater and Carbon counties would result economic opportunity, with increased employment opportunities and relatively high-paying jobs. Therefore the financial status of many residents of these counties is likely to increase, which would correspondingly increase support for cumulative development activities, particularly among

those segments of the community which benefit directly or indirectly from the increased economic activity. However, those residents and area visitors who prefer solitude, isolation and undeveloped vistas are likely to experience heightened levels of dissatisfaction associated with cumulative natural gas development activities. Those whose economic activities and/or lifestyles occupy the same areas as natural gas activities, such as ranchers and recreationists are among those most likely to be dissatisfied. Moreover, if area residents perceive that wildlife habitat and other resources are being degraded by development, levels of satisfaction could become greater and more widespread.

The foregoing cumulative socioeconomic analysis assumes that natural gas development in the CIA area would proceed at historic cyclic levels. Given that substantial infrastructure capacity exists in Rock Springs and Rawlins, substantial increases in the pace of development could occur before most systems would be overburdened, although certain local government services (e.g., road maintenance, emergency response) could be strained if the pace of growth exceeds the flow of revenues for gas projects or if housing becomes available in Wamsutter or Baggs, as discussed above.

Dramatic and sustained increases in natural gas demand and prices brought about by world events, changes in national energy policy or sustained high levels of economic growth could result in corresponding dramatic increases in the pace of development in the CIA area. Given the number of wells authorized in the CIA area, dramatic increases in the pace of development could result in socioeconomic impacts substantially larger than those identified above. It is conceivable that population increases associated with accelerated development could exceed housing resources and community facility and service demand even in large communities such as Rock Springs and Rawlins. In the case of such an extreme scenario, negative community impacts could be avoided or mitigated by the development and implementation of a coordinated impact plan. Natural gas companies would require a substantial period of time to mobilize to achieve large increases in the pace of development. During that time, coordinated impact planning on the part of local, state and federal government and industry could enhance the ability of communities within the CIA area to accommodate growth. Accelerated development would be accompanied by substantial increases in tax revenues, although those revenues could lag needed expenditures for community infrastructure and service improvements by several years. To mitigate this lag in revenues, local, state and federal government and industry would need to develop mechanisms to provide up-front funding for these improvements in anticipation of development.

5.3.13 Transportation

The CIA area for transportation includes the project site and the county roads and state and federal highways which provide access to the site.

Historic and existing traffic within the DFPA includes that associated with grazing uses, recreation and oil and gas exploration. This traffic is considered to be minimal and seasonal in nature. The Proposed Action and alternatives are the only RFFA's within the DFPA; therefore, cumulative transportation impacts within the project area are anticipated to be similar to those attributable to the Proposed Action or alternatives.

County roads which provide access to the DFPA, particularly SCR 23/CCR 701, the Wamsutter/Dad Road, will receive cumulative impacts from oil and gas development. The increased traffic associated with drilling and field development in the CD/WII and Creston/Blue Gap project areas, coupled with those of the Proposed Action or alternatives would accelerate

maintenance requirements on the Wamsutter/Dad Road, and increase the potential for accidents. A portion of the substantial tax revenues which would accrue to Sweetwater and Carbon counties from each of these projects could be used to offset costs of increased maintenance and emergency service requirements.

CCR 700 provides access to the southeastern corner of the DFPA and to the South Baggs Natural Gas project area. Because little use of CCR 700 is anticipated by DFPA operators, depending on the location and timing of wells and ancillary facilities in the southeastern portion of the DFPA, cumulative transportation impacts on this road should be minimal.

Traffic increases on I-80 and WYO 789 associated with cumulative natural gas development in southeastern Sweetwater County and southwestern Carbon County would occur. Both highways have capacity to accommodate increases in traffic before deterioration in current levels of service occur (Greisbach 2001). Cumulative increases in the probability of traffic accidents on I-80 would be negligible, given the substantial volumes of traffic already on that highway. Cumulative accident increases on WYO 789 would depend, in part, on the pace of natural gas development.

5.3.14 Health and Safety

The area of analysis for potential cumulative impacts to health and safety is the DFPA. The Proposed Action and alternatives are the only RFFA's anticipated for the project area; therefore, cumulative impacts to health and safety conditions are anticipated be similar to those described for the Proposed Action and alternatives.

5.3.15 Noise

The area for potential cumulative noise impacts is the DFPA and immediately adjacent areas. Existing sound disturbances within the DFPA and immediately adjacent areas are limited to those associated with grazing activities, dispersed recreation, aircraft flights and traffic on area roads and highways. The Proposed Action and alternatives are the only RFFAs in the DFPA that would create additional sound disturbance. Cumulative sound disturbances associated with well drilling and pipeline, road and ancillary facility construction in adjacent fields would similarly be short-term in nature. Therefore, cumulative noise impacts would be similar to those associated with the Proposed Action and alternatives.

CHAPTER 6

CONSULTATION AND COORDINATION

CHAPTER 6

CONSULTATION AND COORDINATION

6.0 CONSULTATION AND COORDINATION

An environmental impact statement (EIS) must be prepared when a federal government agency considers approving an action within its jurisdiction that may impact the human environment. An EIS aids federal officials in making decisions by presenting information on the physical, biological, and social environment of a proposed project and its alternatives. The first step in preparing an EIS is to determine the scope of the project, the range of action alternatives, and the impacts to be included in the document.

The Council on Environmental Quality (CEQ) regulations (40 CFR, Parts 1500-1508) require an early scoping process to determine the issues related to the proposed action and alternatives that the EIS should address. The purpose of the scoping process is to identify important issues, concerns, and potential impacts that require analysis in the EIS.

The Desolation Flats Natural Gas Project EIS was prepared by a third party contractor working under the direction of and in cooperation with the lead agency for the project, which is the Bureau of Land Management (BLM), Rawlins Field Office, Rawlins, Wyoming, and the Rock Springs Field Office, Rock Springs, Wyoming.

6.1 PUBLIC PARTICIPATION

A Scoping Notice was prepared and submitted to the public by the BLM on May 24, 2000, requesting input into the proposed Desolation Flats Natural Gas Field Development Project. The notice was sent out to the public listed on the BLM mailing list, as well as organizations, groups, and individuals requesting a copy of the scoping document. Public meetings to discuss the proposed project were conducted on June 7, 2000 in Rawlins, Wyoming and on June 8, 2000 in Rock Springs, Wyoming. There were 76 written responses received during the scoping period in response to this project. The issues and concerns identified by the public during the scoping period are summarized in Chapter 1.

During preparation of the EIS, the BLM and the consultant interdisciplinary team (IDT) have communicated with, and received or solicited input from various federal, State, county, and local agencies, elected representatives, environmental and citizens groups, industries, and individuals potentially concerned with issues regarding the proposed drilling action. The contacts made are summarized in the following sections.

The following organizations/individuals either provided comment or were provided the opportunity to comment during the scoping period.

CHAPTER 6: CONSULTATION AND COORDINATION

6.1.1 Federal Offices

U.S. Bureau of Land Management
Rock Springs Field Office
BLM Wyoming State Office
U.S. Representative Barbara Cubin
U.S. Senator Mike Enzi
U.S. Senator Craig Thomas
U.S. Natural Resource Conservation Service
U.S. Army of Corps of Engineers
U.S. Bureau of Reclamation
U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
U.S. Forest Service
U.S. Department. of Energy
U.S. DOI Office of the Solicitor

6.1.2 State Agencies

Governor Jim Geringer
State Engineer's Office
State Senators
Wyoming Department of Environmental Quality
Wyoming Oil and Gas Conservation Commission
Wyoming Business Council
Little Snake Conservation District
Wyoming Game and Fish Department
State Representatives
Wyoming State Planning Coordinator
Wyoming Department of Transportation
Wyoming State Historic Preservation Office
Wyoming Department of Agriculture

6.1.3 County Government

Carbon County Commissioners
Sweetwater County Commissioners
Carbon County Planning Commission
Sweetwater County Planning Commission

6.1.4 Municipalities

Mayor-Baggs
Mayor-Rawlins
Mayor-Green River
Mayor-Wamsutter
Mayor-Rock Springs
Mayor-Superior

6.1.5 Native American Tribes

Northern Arapahoe Tribal Council
Ute Mountain Tribe
Shoshone-Arapahoe Joint Tribal Council
Shoshone Tribal Council
Ute Tribal Council
Uinta-Ouray Tribal Council

6.1.6 Grazing Permittees

Adams and Adams
Andy Peroulis
Purple Sage LLC
Salisbury Livestock Company
Mike Sheehan
Eliza Solace
Three Mill Iron Ranch
Elza Eversole
Big Sandy & Green River Livestock Co.
Blair and Hay Land & Livestock Co.
Crosson Ranches, Inc.
Douglas Hamel
Don Mines
Mud Springs Livestock Company
George R. Evans
John Peroulis and Sons
Raftopoulos Brothers Livestock
Smith Rancho
Sheehan Ranches
Stratton Sheep Company
Rock Springs Grazing Association
Martin Aimone
John C. Wilde
William Bonomo
Robert Gamble
John W. Hofeldt
Donald Moon
Quarter Circle Three Bar Ranch, LCC

James W. Ramsay
William Thoman
Don Vercimak
Sage Creek Ranch, LCC
William Tripp
Clark Weber

6.1.7 Lease and ROW Holders

Marathon Oil Company
Merit Energy Company
Sante Fe Snyder Corporation
Tom Brown, Inc.
BP Amoco
Colorado Interstate Gas Company
San Marco Petroleum
Thomas Erickson
Celsius Energy Company
ABO Petroleum Corporation
Andex Resources, LLC
Aztex Gas and Oil Corporation
Van K. Bullock
Captiva Resources, Inc.
Centennial Venture III, LLC
CIG Exploration, Inc.
CNG Producing Company
John L. Cox
Davis Oil Company
Double Eagle Petroleum & Mining Company
Energen Resources Corporation
Margaret M. Farinholt
Forcenergy, Inc.
Gunlikson Petroleum, Inc.
H. B. Hillman Trust
HILR, Trust
Hollis Oil and Gas Company
Industrial Gas Service, Inc.
William E. Jeffers
K N Production Company
Key Production Company, Inc.
Lario Oil and Gas Company
Liberty Petroleum Corporation
Lyco Energy Corporation
Markus Production, Inc.
McCulliss Resources Company, Inc.
W. A. Moncrief Jr.
Mull Drilling Company
Niwot Resources, LLC
Northern Geophysical
Odyssey Exploration, Inc.
Don Parsons
Phillips Petroleum Company
Plains Petroleum Operating Company
Quantum Geophysical
John B. Roden Jr.
Samedan Oil Corporation
San Marco Petroleum, Inc.
EOG Resources, Inc.
Basin Exploration, Inc.
Questar Exploration and Production Co.
Pennzoil Company
Williams Gas Processing Company
Westport Oil and Gas Company, Inc.
Kerr-McGee
Exxon USA
Questar Pipeline Company
Allen and Kirmse, Ltd.
Armstrong Resources
Big West Oil and Gas, Inc.
Cabot Oil and Gas Corporation
Cellular, Inc. Network
Chevron USA Production Company
Clayton William Energy
Concho Resources, Inc.
Coyote Oil and Gas
Devon Energy Corporation
Emerald Operating Company
Enron Oil and Gas Company
Fidelity Oil Holding
Gundry-White D.
William G. Helis Est.
D. B. Hillman
Carol Ann Hoffman
HPC, Inc.
Intrepid Production Company
Journey's End, Inc.
Kaisar-Francis Oil
KLT Gas, Inc.
Larry Barnes Petroleum
Los Chicos
Marico Exploration, Inc.
J. H. Marshall II Trust
Medallion Exploration
William Moss
MYCO Industries, Inc.
North American Resources Co.
Ocean Energy, Inc.
OXY USA Company
Pepco, Inc.
Pioneer Natural Resources USA, Inc.
Prima Exploration, Inc.
Resources Strategies
Sacramento Partners, LP
Samson Resources Company
Santa Fe Snyder Corporation

Seagull Energy E & P, Inc.
South Pass Resources, Inc.
Stovall Oil Company
Texaco Exploration and Production, Inc.
Texas Eastern Skyline
Tindall Operating Company
Topaz Mineralogical
Union Pacific Wyoming Gathering, Inc.
Vegas Production Company
Westport Oil and Gas Company, Inc.
Windsor Oil and Gas, Inc.
WYGAP
Xeric Oil and Gas Corporation
Lillie M. Yates Est.
Apache Corporation
Forest Oil Corporation
ConWest Exploration (Delaware) Inc.
W.A.. Moncrief Jr.
IT Properties
Corbin J. Robertson
Roemer Oil Company
Bar Gas LLC
Irwin Rubenstein
Sharbro Oil, Ltd. Company
Stanley Energy, Inc.
T. H. McElvain Oil and Gas, Ltd.
Texas Oil and Gas Corporation
The Gary Williams Company
Topanga, LLC
True Oil Company
Union Pacific Resources Company
Veritas DGC Land, Inc.
White Energy Corporation
Arthur W. Winter Trust
Wyoming Exploration, Ltd.
Yates Petroleum Corporation
Yates Drillling Company
Alenco Oil and Gas (ND) Inc.
John P. Strang
H S Resources, Inc.
Costilla Energy, Inc.
John F. Sheridan O & G Properties
Lamar B. Roemer
Intrepid Oil and Gas LLC
Merit Partners LP

6.1.8 Landowners

All private landowners are included under one of the above categories.

6.1.9 Local Media

Casper Star-Tribune
Rock Springs Rocket Miner
KGWC TV - Casper
KRAI - Craig, Colorado
KQSW/KRKK - Rock Springs
KTWO - Casper
KUWR - University of Wyoming
Meeker Herald
Craig Daily Press
KUGR - Green River
Channel 27 - Craig, Colorado
Rawlins Daily Times
Wyoming State Tribune/Eagle
Green River Star
KRAL - Rawlins
KSIT - Rock Springs
KTWO TV - Casper
Northwest Colorado Daily News
Rangely Times
KMKX - Rock Springs
KYCS - Rock Springs

6.1.10 Other Agencies, Industry Representatives, Individuals, and Organizations

Audubon Society
Wilderness Society
The Nature Conservancy
Wyoming Association of Professional Archeologists
Department of Geology
Independent Petroleum Association of Mountain States
Murie Audubon Society
Public Lands Advocacy
Wyoming Farm Bureau Federation
Wyoming Public Lands Council
Dolar Oil Properties
Barbara Parsons
Biodiversity Associates-Friends of the Bow
Kelly Crane
Northwest Colo. Wild Horse Assoc.
Humane Equine Rescue and Development Society
ISPM & B
Animal Protection Institute
Predator Project
National Wildlife Federation
Carbon County Stockgrowers
Field Museum of Natural History
Wyoming Woolgrowers Association
Wind River Multiple Use Advocates
Charmaine Delmatier
Wyoming Wildlife Federation
The Nature Conservancy
Petroleum Association of Wyoming
Sierra Club
Wyoming Outdoor Council
Wyoming Stockgrowers Association
Karen Larsen
Wyoming State Grazing Board
Sinapu
Dr. Patricia M. Fazio
Wyoming Advocates for Animals
Andrea Lococo
Humane Society of United States
Gary Zakotnik

Approximately 100 additional “Other Agencies, Industry Representatives, Individuals, and Organizations” received a copy of the Scoping Notice.

6.2 LIST OF PREPARERS

The following tables identify the BLM IDT (Table 6-1) and the consultant IDT (Table 6-2) that were principally involved with preparing this EIS.

Table 6-1. List of BLM Interdisciplinary Reviewers.

Name	Responsibility
RAWLINS FIELD OFFICE	
Missy Cook	Clerical and Environmental Coordination
Susan Foley	Soil Scientist
Sandra Meyers	Cultural Resources
John Spehar	Team Leader/NEPA Coordinator
Chris Otto	Range Resources
Kip Purinton	Petroleum Engineer
Mark Newman	Paleontology/Geology
Krystal Clair	Recreation and Visual Resources
Mary Read	Wildlife/Fisheries, Special Status Species
Gay Seay	Realty/Lands
Alberta Settle	Hazardous Material
Chuck Reed	Wild Horses
ROCK SPRINGS FIELD OFFICE	
Teri Deakins	RSFO Team Leader
John MacDonald	Surface Protection, Soils
Dave Valenzuela	Geology, Minerals, Paleontology
Judly Mueller	Lands
Jim Dunder	Wildlife, T&E Wildlife, Special Status Plants
Andy Tenney	Recreation, Visual Resources, Wilderness
Kevin Lloyd	Fisheries
Jim Glennon	Botany, T&E Plants, Special Status Plants
Dennis Doncaster	Water Resources
Thor Stephenson	Range, Wild Horses
Russ Tanner	Cultural Resources
Renee Dana	Planning
WYOMING STATE OFFICE	
Susan Caplan	Air Quality
Vicki Mistarka	Fluid Minerals
Dale Hanson	Paleontology

Table 6-2. List of Consultant Interdisciplinary Team EIS Preparers.

Principal Interdisciplinary Team		
Name	**Affiliation**	**Responsibility**
Gary Holsan	Gary Holsan Environmental Planning	Interdisciplinary Team Leader, Project Manager
Mike Evers	Western Water Consultants	Water Resources
Larry Hayden-Wing	Hayden-Wing Associates	Wildlife/Fisheries, Special Status Animals and Fish
George Blankenship	Blankenship Consulting	Socioeconomics, Transportation, Health & Safety, Noise
Craig Johnson		Visual Resources and Recreation
Doug Henderer	Buys & Associates	Air Quality
Brenda Schladweiler	BKS Environmental Associates, Inc	Soils and Vegatation
Jana Pastor	Western Archaeological Services	Cultural Resources
Gustav Winterfeld	Erathem-Vanir Geological Consultants	Geology/Paleontology, Mineral Resources
Technical Support Team		
Travis Olson	Hayden-Wing Associates	Wildlife Biologist
Scott Mullner	Hayden-Wing Associates	Wildlife/Fisheries Biologist
Jeffrey Winstead	Hayden-Wing Associates	Wildlife Biologist, Cartographer
Connie Hedley	Hayden-Wing Associates	Document Editing and Production
Esther Brow	Hayden-Wing Associates	Document Editing and Production

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GLOSSARY

GLOSSARY

abandon: To cease producing oil or gas from a well when it becomes unprofitable. An exploration well may be abandoned after it has been proven nonproductive. Usually, some of the casing is removed and salvaged, and one or more cement plugs placed in the borehole to prevent migration of fluids between formations.

acre foot: A volume of water that covers an area of one acre to a depth of one foot (43,560 cubic feet or 325,851 gallons).

ad valorem: Levied according to assessed value.

affected environment: The biological, physical, and socioeconomic environment that will or may be changed by actions proposed and the relationship of people to that environment.

allotment: An area of land where one or more permittees graze their livestock. Generally consists of public land but may include parcels of private or State lands. The number of livestock and season of use are stipulated for each allotment. An allotment may consist of several pastures or be only one pasture.

alternative: A combination of management prescriptions applied in specific amounts and locations to achieve a desired management emphasis or expressed in goals and objectives. One of several policies, plans, or projects proposed for decision making.

ambient: The environment as it exists at the point of measurement and against which changes or impacts are measured.

ambient air quality: The state of the atmosphere at ground-level as defined by the range of measured and/or predicted ambient concentrations of all significant pollutants for all averaging periods of interest.

ambient concentration: The mass of a pollutant in a given volume of air. It is typically measured as micrograms of pollutant per cubic meter of air.

ambient standards: The absolute maximum level of a pollutant allowed to protect either public health (primary) or welfare (secondary).

animal unit month (AUM): The amount of forage necessary for the sustenance of one cow/calf pair for 1 month.

Application for Permit to Drill (APD): The Department of Interior application permit form to authorize oil and gas drilling activities on federal land.

aquifer: A water-bearing bed or layer of permeable rock, sand, or gravel capable of yielding water, or the part of a water-driven reservoir that contains the aquifer.

assemblage: A group of rocks grouped together by age or similar origin.

background concentration: The existing levels of air pollutant concentration in a given region. In general, it includes natural and existing emission sources, but not future emission sources.

badland: Steep or very steep, commonly non-stony barren land dissected by many intermittent drainage channels. Badland is most common in semi-arid and arid regions where streams are entrenched in soft geologic material. Runoff potential is very high, and geologic erosion is active in such areas.

big game: Those species of large mammals normally managed as a sport hunting resource.

borehole: A circular hole made by boring; especially a deep hole of small diameter, such as an oil well or a water well.

Bureau of Land Management (BLM): The Department of Interior agency responsible for managing most Federal Government subsurface minerals. It has surface management responsibility for Federal lands designated under the Federal Land Policy and Management Act of 1976.

canopy: The more-or-less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

carrying capacity: The ability of an area of land to sustain a species [generally livestock] over time without permanently degrading the land resources.

casing: Steel pipe placed in an oil or gas well to prevent the hole from collapsing.

completion: The activities and methods to prepare a well for production. Includes installation of equipment for production from an oil or gas well.

conglomerate: A sedimentary rock comprised of an unstratified mixture or stratified layers of cobbles, gravel, and sand.

coniferous: Referring to a cone-bearing, usually evergreen, tree.

contrast: The effect of a striking difference in the form, line, color, or texture of the landscape features within the area being viewed.

corridor: A strip of land, usually a few to many times the width of a right-of-way through which one or more facilities (e.g. pipelines, roads, powerlines) may be located.

Council on Environmental Quality (CEQ): An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

criteria pollutants: Air pollutants for which the EPA has established State and National Ambient Air Quality Standards. These include particulate matter (PM_{10}), nitrogen oxides (NO_X), sulfur dioxide (SO_2), carbon monoxide (CO), and volatile organic compounds (VOC).

crucial range: Any particular seasonal range or habitat component that has been documented as the determining factor in a population's ability to maintain itself at a certain level over the long-term.

cubic feet per second (cfs): The rate of discharge representing a volume of 1 cubic foot of water passing a given point during 1 second.

cubic foot: The volume of gas contained in one cubic foot of space at a standard pressure base of 14.7 psi and a standard temperature base of 60 degrees Fahrenheit.

cultural resources: The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, etc.) and the conceptual content or context (as a setting for legendary, historic, or prehistoric events, such as a sacred area of native peoples, etc.) of an area of prehistoric or historic occupation.

GLOSSARY

cumulative impact: The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taken place over a period of time (40 CFR 1508.7).

deciduous: Trees or shrubs that lose their leaves each year during a cold or dry season.

decibel: A unit of measurement of noise intensity. The measurements are based on the energy of the sound waves and units are logarithmic. Changes of 5 decibels or more are normally discernible to the human ear.

development well: A well drilled in proven territory (usually within 1 mile of an existing well).

directional drilling: The intentional deviation of a wellbore from vertical to reach subsurface areas off to one side from the drilling site.

discharge: The volume of water flowing past a point per unit time, commonly expressed as cubic feet per second (cfs), gallons per minute (gpm), or million gallons per day (mgd).

dispersion: The spreading out of pollutants. Generally, used to show how much an air pollutant will spread from a particular point.

displacement: As applied to wildlife, forced shifts in the patterns of wildlife use, either in location or timing of use.

disposal well: A well into which produced water from other wells is injected into an underground formation for disposal.

dissolved solids: The total amount of dissolved material, organic and inorganic, contained in water or wastes.

disturbance: An event that changes the local environment by removing organisms or opening up an area, facilitating colonization by new, often different, organisms.

disturbed area: Area where natural vegetation and soils have been removed or disrupted.

diversity: The distribution and abundance of different plant and animal communities and species within the area covered by a Land and Resource Management Plan.

drainage: Natural channel through which water flows some time of the year. Natural and artificial means for effecting discharge of water as by a system of surface and subsurface passages.

drill bit: The cutting devise used to drill a well. It is typically made of hardened steel, and may have industrial grade diamond components.

drilling mud: The circulating fluid used to bring cuttings out of the well bore, cool the drill bit, and provide hole stability and pressure control. Drilling mud includes a number of additives to maintain the mud at desired viscosities and weights. Some additives that may be used are caustic, toxic, or acidic.

drill pad: Relatively flat work area that contains equipment and facilities used for well drilling and well completion.

drill pipe: The heavy seamless tubing used to rotate the drill bit and circulate the drilling fluid. The standard drill pipe section is 30 feet long (a joint).

drill rig: The mast, draw works, and attendant surface equipment of a drilling workover unit.

dry hole: Any well incapable of producing oil or gas in commercial quantities. A dry hole may produce water, gas or even oil, but not enough to justify production.

earthquake: Sudden movement of the earth's crust resulting from faulting, volcanism, or other mechanisms.

ecosystem: An interacting system of organisms considered together with their environment for example, marsh, watershed, and stream ecosystems.

effects: These include: a) Direct effects, which are caused by the action and occur at the same time and place; b) Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems. Effects and impacts as used in these regulations are synonymous. Effects includes ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health, whether direct, indirect, or cumulative.

> Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial (40 CFR 1508.8).

emergent vegetation: Erect, rooted, herbaceous plants that project out of the water, or "emerge."

emission factor: An empirically derived mathematical relationship between pollutant emission rate and some characteristic of the source such as volume, area, mass, or process output.

endangered species (animal): Any animal species in danger of extinction throughout all or a significant portion of its range. This definition excludes species of insects that the Secretary of the Interior determines to be pests and whose protection under the Endangered Species Act of 1973 would present an overwhelming and overriding risk to man.

endangered species (plant): Species of plants in danger of extinction throughout all or a significant portion of their ranges. Existence may be endangered because of the destruction, drastic change, or severe curtailment of habitat, or because of over exploitation, disease, predation, or even unknown reasons. Plant taxa from very limited areas (e.g. the type localities only), or from restricted fragile habitats usually are considered endangered.

endemic: Confined naturally to a particular geographic area. Often used in opposition to the work epidemic.

environment: The aggregate of physical, biological, economic, and social factors affecting organisms in an area.

environmental assessment (EA): An investigation of a proposed action and alternatives to that action and their direct, indirect, and cumulative environmental impacts; the process which provides the necessary information for reaching an informed decision and the information needed for determining whether a proposed action may have significant environmental effects and determining the type of environmental documents required.

environmental impact statement (EIS): An analysis of alternative actions and their predictable environmental effects, including physical, biological, economic, and social consequences and their interactions; short- and long-term effects; direct, indirect, and cumulative effects.

environmentally conservative: Assumes an environmental outcome usually greater in impacts than the real outcome of an action; a method used or conclusion reached where the assessed impact is of a greater magnitude than that expected to occur as a result of the implemented action.

ephemeral drainage: A drainage area or a stream that has no base flow. Water flows for a short time each year but only in direct response to rainfall or snowmelt events.

ephemeral stream: A stream that flows only in direct response to precipitation in the immediate watershed or in response to the melting of a cover of snow and ice and which has a channel bottom that is always above the local water table.

emission: Air pollution discharge into the atmosphere, usually specified by mass per unit time.

erosion: The removal, detachment, and entrainment of earth materials by weathering, dissolution, abrasion, and corrosion, later to be transported by moving water, wind, gravity, or glaciers.

exploration: The search for economic deposits of minerals, ore, and other materials through practices of geology, geochemistry, geophysics, drilling, and/or mapping.

exploration well: A well drilled in an area where there is no oil or gas production.

fault: A fracture in bedrock along which there has been vertical and/or horizontal movement caused by differential forces in the earth's crust.

federal lands: All lands and interests in lands owned by the U.S. that are subject to the mineral leasing laws, including mineral resources or mineral estates reserved to the U.S. in the conveyance of a surface or non-mineral estate.

fisheries: Streams and lakes used for fishing.

flaring: The controlled ignition of natural gas at a wellhead.

floodplain: That portion of a river valley, adjacent to the channel, which is built of recently deposited sediments and is covered with water when the river overflows its banks at flood stages.

fluvial: Comprehensive term for river processes.

footprint: The actual surface area physically disturbed by oil and gas operations and ancillary facilities.

forage: Vegetation of all forms available for animal consumption.

forb: A broad-leafed flowering herb other than grass.

fracing (fracturing): A method of stimulating well production by increasing the permeability of the producing formation. Under extremely high hydraulic pressure, the fracturing fluid (water, oil, dilute hydrochloric acid, or other fluid) is pumped into the formation which parts or fractures it. Proppants or propping agents such as sand or glass beads are pumped into the formation as part of the fracturing job. The proppants become wedged in the open fractures, leaving channels for oil to flow into the well after the hydraulic fracture pressure is released. This process is often called a "frac job." When high concentrations of acid are used, it may be called an "acid frac job."

fugitive dust: Airborne particles emitted from any source other then through a controllable stack or vent.

functional value: A term that refers to the various functions performed by wetlands and the values people place on those functions. Functions are the chemical, physical, and biological processes or attributes of a wetland without regard to their importance to society. They include groundwater recharge and discharge, sediment trapping, nutrient/pollutant retention and removal, shoreline anchoring and dissipation of erosive forces, food chain support, wildlife and fish habitat, and heritage value (including active and passive recreation, uniqueness, etc.).

game species: Animals commonly hunted for food or sport.

grade: A slope stated in terms of feet per mile or as feet per feet (percent); the content of precious metal per volume of rock (ounces per ton).

groundwater: Water contained in the pore spaces of consolidated and unconsolidated surface material.

habitat: A specific set of physical conditions that surround a single species, a group of species, or a large community. In wildlife management, the major components of habitat are considered to be food, water, cover, and living space.

habitat type: The aggregate of all areas that support or can support the same primary vegetation at climax.

herbaceous: The plant strata which contain soft, not woody, stemmed plants that die to the ground in winter.

human environment: The factors that include, but are not limited to biological, physical, social, economic, cultural and aesthetic factors that interrelate to form the environment.

hydric soils: A soil that is saturated, flooded, or ponded with water long enough during the growing season (i.e., soil temperature of 41°F at 20 inches depth) to develop anaerobic soil conditions (i.e., reduced oxygen levels). These soils develop characteristics that are indicative of the wet and anaerobic conditions. Such characteristics may include an undecomposed organic surface layer (histic epipedon), surface horizons with low chromas (i.e., very dark brown to black), organic staining and streaking, grey-colored layers of horizons, iron concretions, and/or light grey- or rust-colored mottles or specks of highly contrasting color. These characteristics must generally occur within 50 percent of the root zone.

hydrology: A science that deals with the properties, distribution, and circulation of surface and subsurface water.

hydrophytic plants: Those species which either require or tolerate wet or saturated soils and are therefore indicative of these conditions. Vegetation is a good indicator of the physical conditions on a given site. Such conditions include soil moisture.

GLOSSARY

hydrostatic testing: Testing of the integrity of a newly placed, but uncovered pipeline for leaks. The pipeline is filled with water and pressurized to operating pressures, and the pipeline is visually inspected.

impact: The results of an action on the environment; the impact may be primary (direct) or secondary (indirect); the term impact is synonymous with effect according to 40 CFR 1508.8.

impoundment: The accumulation of any form of water in a reservoir or other storage area.

increment: Incremental standards (prevention of significant deterioration) are the maximum amounts of pollutants allowed above the baseline in regions of clean air.

infiltration: The movement of water or some other liquid into the soil or rock through pores or other openings.

infrastructure: The basic framework or underlying foundation of a community including road networks, electric and gas distribution, water and sanitation services, and facilities.

injection well: A well used to inject fluids into an underground formation to increase reservoir pressure.

interdisciplinary team (IDT): A group selected to work within the NEPA process in scoping, analysis, and document preparation. The purpose of the team is to integrate its collective knowledge of the physical, biological, economic, and social sciences and the environmental design arts into the environmental analysis process. Interaction among team members often provides insight that otherwise would not be apparent.

intermittent stream: A stream or reach of a stream that drains a watershed of at least one square mile; or a stream or reach of a stream that is below the local water table for at least some part of the year, and obtains its flow from both surface runoff and groundwater discharge.

irreversible: A term that describes the loss of future options. Applies primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity that are renewable only over long periods of time.

irretrievable: A term that applies to the loss of production, harvest, or use of natural resources. For example, some or all of the timber production from an area is lost irretrievably while an area is serving as a winter sports site. The production lost is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume timber production.

jurisdictional wetlands: "Those wetlands which are within the extent of COE regulatory overview" (33 CFR 328.1 and (2). For an area to be identified as a jurisdictional wetland, the area must exhibit positive indicators of wetland hydrology, hydrophytic vegetation, and hydric soils. Those areas that do not meet the three parameters are uplands or non-jurisdictional wetlands. The Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory 1987) describes technical criteria for determining hydrophytic vegetation, hydric soils, and wetland hydrology, and therefore the occurrence of jurisdictional wetlands.

landform: Any physical, recognizable form or feature of the Earth's surface, having a characteristic shape and produced by natural causes. Includes major features such as plains, plateaus, and mountains, and minor features, such as hills, valleys, slopes, canyons, arroyos, and alluvial fans.

landscape character: The arrangement of a particular landscape as formed by the variety and intensity of the landscape features as defined as the four basic elements (form, line, color, and texture). These factors give the area a quality that distinguishes it from its immediate surroundings.

landslide: A perceptible downhill sliding or falling of a mass of soil and rock lubricated by moisture or snow.

land use: Land uses determined for a given area that establish the types of activities allowed (e.g., mining, agriculture, timber production, residential, industrial).

lead agency: The agency or agencies preparing or having taken primary responsibility for preparing the environmental impact statement (40 CFR 1508.16).

lease: (1) A legal document that conveys to an operator the right to drill for oil and gas. (2) The tract of land on which a lease has been obtained, where producing wells and production equipment are located.

lek: An assembly area for communal courtship display, usually in reference to sage grouse or other grouse.

lithic scatter: A surface scatter of cultural artifacts and debris that consists entirely of lithic (i.e., stone) tools and chipped stone debris. This is a common prehistoric site type that is contrasted to a cultural material scatter, which contains other or additional artifact types such as pottery or bone artifacts, to a camp which contains habitation features, such as hearths, storage features or occupation features, or to other site types that contain different artifacts or features.

loam: A mixture of sand, silt, and clay containing between 7 and 27 percent clay, 28 to 50 percent silt and less than 50 percent sand.

long-term impacts: For the purpose of the Desolation Flats Natural Gas Field Development NEPA analysis, long-term effects generally last beyond the construction period.

management area: An area composed of aggregate pieces of land (generally several to many analysis areas) to which a given management objective and prescriptions are applied.

management direction: A statement of multiple use and other goals and objectives, along with the associated management prescriptions and standards and guidelines to direct resource management.

marginal properties: Fee and/or federal lease holdings with natural gas/oil reserves that are approaching depletion to the extent that any profit from continued production is doubtful. An oil/gas holding becomes a marginal property when the cost to drill, complete, and equip the well exceeds the ability to recover these costs during its lifetime.

methane (CH_4): The simplest hydrocarbon; natural gas is nearly pure methane.

mineral rights: Reserved mineral rights are the retention of ownership of all or part of the mineral rights by a person or party conveying land to the United States. Conditions for exercising these rights have been defined in the Secretary's "Rules and Regulations to Govern Exercising of Mineral Rights Reserved in Conveyances to the United States" attached to and made a part of deeds reserving mineral rights.

mitigate: To lessen the severity.

mitigation: Avoiding the impact altogether by not taking a certain action or parts of an action; minimizing impacts by limiting the degree of magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and/or compensating for the impact by replacing or providing substitute resources or environments.

modeling: A mathematical or physical representation of an observable situation. In air pollution control, models afford the ability to predict pollutant distribution or dispersion from identified sources for specified weather conditions.

monitor: To systematically and repeatedly watch, observe, or measure environmental conditions in order to track changes.

mud system: A system used to manage suspended mud in the well-drilling process.

National Ambient Air Quality Standards (NAAQS): The allowable concentrations of air pollutants in the air specified by the Federal government. The air quality standards are divided into primary standards (based on the air quality criteria and allowing an adequate margin of safety and requisite to protect the public health) and secondary standards (based on the air quality criteria and allowing an adequate margin of safety and requisite to protect the public welfare from any unknown or expected adverse effects of air pollutants).

National Environmental Policy Act (NEPA): The federal law established in 1969, which went into effect on January 1, 1970, that (1) established a national policy for the environment, (2) requires federal agencies to become aware of the environmental ramifications of their proposed actions, (3) requires full disclosure to the public of proposed federal actions and a mechanism for pubic input into the federal decision-making process, and (4) requires federal agencies to prepare an environmental impact statement for every major action that would significantly affect the quality of the human environment.

National Register of Historic Places: A list of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture.

native species: Plants that originated in the area in which they are found, i.e., they naturally occur in that area.

natural gas: Those hydrocarbons, other than oil and other than natural gas liquids separated from natural gas, that occur naturally in the gaseous phase in the reservoir and are produced and recovered at the wellhead in gaseous from. Natural gas includes coal bed methane gas.

No Action Alternative: The management direction, activities, outputs, and effects that are likely to exist in the future if the current plan would continue unchanged.

Notice of Staking: Prior to filing a complete Application for Permit to Drill (APD) an Operator may wish to file a Notice of Staking (NOS). Under this procedure, the site is surveyed and staked, and the onsite inspection is used to provide information to the Operator prior to the Operator committing time and money in preparing an APD which might not reflect agency concerns.

noxious weeds: Officially designated undesirable or invading weedy species generally introduced into an area due to human activity.

oil and gas field: A natural accumulation of oil and gas in the subsurface. Oil and gas may be present in two or more reservoirs at different depths.

oil and gas lease: A federal oil and gas lease is a legal document that gives the lease holder the right to explore for and develop any oil and gas that may be present under the area designated in the lease while complying with any surface use conditions which may have been stipulated when the lease was issued.

ozone: A molecule containing three oxygen atoms (O_3) produced by passage of an electrical spark through air or oxygen (O_2).

paleontology: The science that deals with the history and evolution of life on earth.

parent materials: Unconsolidated material formed from bedrock which undergoes further changes to form soil.

particulate matter: A particle of soil or liquid matter (e.g., soot, dust, aerosols, fumes and mist).

perennial stream: A stream or reach of a stream that flows throughout the year.

permeability: Extent that a substance is open to passage or penetration, especially by fluids.

permeable: The property or capacity of a porous rock, sediment, or soil to transmit a liquid.

permittee (grazing): A person who has livestock grazing privileges on an allotment or allotments within the resource area.

pH: The negative $\log_{10}$ of the hydrogen ion activity in solution; a measure of acidity or basicity of a solution.

physiographic: pertaining to the genesis and evolution of landforms.

play: An area of anticipated or known oil and gas reserves.

playa: The shallow central basin of a desert plain, in which water gathers after a rain and is evaporated.

PM_{10}: Airborne suspended particles with an aerodynamic diameter of 10 microns or less.

preferred alternative: The alternative identified in the EIS as the action favored by the agency.

prevailing wind: The most frequent compass direction from which the wind blows.

prevention of significant deterioration of air quality (PSD): A classification established to preserve, protect, and enhance the air quality in National Wilderness Preservation System areas in existence prior to August 1977 and other areas of National significance, while ensuring economic growth can occur in a manner consistent with the preservation of existing clean air resources. Specific emission limitations and other measures, by class, are detailed in the Clean Air Act (42 U.S.C. 1875 et 15q.).

produced water: Formation water pumped during the development of a gas well.

proppants: Proppants or propping agents are substances such as sand or glass beads that are pumped into the formation as part of the fracturing job. The proppants become wedged in the open fractures, leaving channels for oil to flow into the well after the hydraulic fracture pressure is released. This process is often called a "frac job." When high concentrations of acid are used, it may be called an "acid frac job" (see also fracing/fracturing).

PSD increments: The maximum allowable increase in pollutant concentrations permitted over baseline conditions as specified in the EPA Prevention of Significant Deterioration (PSD) regulations (40 CFR Part 52.21). The regulations apply only to area currently attaining NAAQS/WAAQS. Most National Parks and Wilderness areas are Class I Areas, where almost no future pollution increase is permitted. Most other areas are Class II Areas, where moderate increases in pollution levels are allowed.

public land: Lands or interests in lands owned by the United States and administered by the Secretary of Interior through the Bureau of Land Management, without regard to how the United States acquired ownership.

range: Land producing native forage for animal consumption and lands that are revegetated naturally or artificially to provide forage cover that is managed like native vegetation, which are amenable to certain range management principles or practices.

raptor: Living on prey; a group of carnivorous birds consisting of hawks, eagles, falcons, kites, vultures, and owls.

recharge: Replenishment of the water supply in an aquifer through the outcrop or along fracture lines.

reclamation: rehabilitation of a disturbed area to make it acceptable for designated uses. This normally involves regrading, replacement of topsoil, revegetation and other work necessary to restore it for use.

record of decision (ROD): A decision document for an Environmental Impact Statement or Supplemental EIS that publicly and officially discloses the responsible official's decision regarding the actions proposed in the EIS and their implementation.

reserve pit: (1) Usually an excavated pit that may be lined with plastic, that holds drill cuttings and waste mud. (2) Term for the pit which holds the drilling mud.

reserves: Identified resources of mineral-bearing rock from which the mineral can be extracted profitably with existing technology and under present economic conditions.

residuum: Unconsolidated material that accumulates by weathering of parent material in place.

revegetation: The re-establishment and development of self-sustaining plant cover. On disturbed sites, human assistance will speed natural processes by seed bed preparation, reseeding and mulching.

riffle: A shallow section of stream with rapid current and a surface broken by gravel, rubble, or boulders.

right-of-way (ROW): The legal right for use, occupancy, or access across land or water areas for a specified purpose or purposes.

riparian: Land areas which are directly influenced by water. They usually have visible vegetative or physical characteristics showing this water influence. Streamsides, lake borders, or marshes are typical of riparian areas.

rip rap: A foundation or erosion control device consisting of rocks thrown together without order.

roosting: To rest or sleep in a roost. A bird will typically use the same roost of an extended period of time.

runoff: That part of precipitation that appears in surface streams. Precipitation that is not retained on the site where it falls and is not absorbed by the soil.

salinity: A measure of the amount of mineral substances dissolved in water.

scatter (archeological): Random evidence of prior disturbance that is distributed about an area rather than concentrated in a single location.

scoping: An early and open process for determining the scope of issues to be addressed in an EIS and for identifying the significant issues related to a proposed action. Scoping may involve public meetings, field interviews with representatives of agencies and interest groups, discussions with resource specialists and managers, and written comments in response to news releases, direct mailings, and articles about the proposed action and scoping meetings.

sediment: Soil or mineral transported by moving water, wind, gravity, or glaciers, and deposited in streams or other bodies of water, or on land.

sediment load: The amount of sediment (sand, silt, and fine particles) carried by a stream or river.

sedimentary: Rock formed from fragments of pre-existing rocks (e.g. sandstone) or by precipitation from solution (e.g. limestone).

seismic: Pertaining to an earthquake or earth vibration, including those that are artificially induced.

seismic operations: Use of explosive or mechanical thumpers to generate shock waves that can be read by special equipment to indicate subsurface conditions.

sensitive species: Those species of plants or animals that have appeared in the Federal Register as proposed for classification and are under consideration for official listing as endangered or threatened species under the Endangered Species Act. This also includes species that are on an official state list or are recognized by the Land Manager as needing special management to prevent their being placed on federal or state lists.

sensitivity level: A particular degree or measure of viewer interest in the scenic qualities of the landscape.

short-term impacts: For the purpose of the Desolation Flats Natural Gas Field Development NEPA analysis, short-term impacts are generally defined as those that would occur during the construction period.

significant impact: A meaningful standard to which an action may impact the environment. The impact may be beneficial, adverse, direct, indirect, or cumulative, and may have short-term or long-term effects.

silt: Any earthy material composed of fine particles, smaller than sand but larger than clay, suspended in or deposited by water.

slump: Slide or earthflow of a soil mass.

soil: Loose, unconsolidated surface material comprising topsoil and subsoil.

soil productivity: The capacity of a soil to produce a specific crop such as fiber and forage, under defined levels of management. It is generally dependent on available soil moisture, nutrients and length of growing season.

spawning: The deposition of eggs and sperm by fish.

species: (1) The classification level of biological nomenclature which categorized each group of related organisms potentially capable of interbreeding; (2) the accepted level of classification to differentiate one specific type of organism from another.

species of concern: Species of concern include federally listed threatened or endangered species, species proposed for listing, BLM sensitive species, and species considered rare or important by the Wyoming Natural Diversity Database (WYNDD).

spp.: An abbreviation for the plural of species.

spud: Begin drilling a well.

stipulation: A legal requirement, specifically a requirement that is part of the terms of a mineral lease. Some stipulations are standard on all federal leases. Other stipulations may be applied to the lease at the discretion of the surface management agency to protect valuable surface resources.

strata: An identifiable layer of bedrock or sediment; does not imply a particular thickness of rock.

substrate: Material consisting of silts, sands, gravels, boulder and woody debris found on the bottom of a stream channel.

surface lands: Lands consisting of the outside part of the solid earth or ocean as contrasted with subsurface or below surface land use(s) such as drilling and mixing.

threatened and endangered species: Any species, plant or animal, which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. Threatened species are identified by the Secretary of the Interior in accordance with the 1973 Endangered Species Act.

topography: The features of the earth, including relief, vegetation, and waters.

topsoil: The uppermost layers of naturally occurring soils suitable for use as a plant growth medium.

total dissolved solids: Total amount of dissolved material, organic or inorganic, contained in a sample of water.

trona: A naturally occurring sodium sesquicarbonate formed in ancient saline lakes. Generally honey or light brown in color, depending on the impurities present. Major natural source of soda ash.

turbidity: A fisheries measurement of the total suspended solids in water expressed as nephelometric turbidity units (NTU).

usable water: Defined by Onshore Oil and Gas Order No. 2 as groundwater with a TDS of 10,000 ppm or less encountered at any depth.

vegetation: All of the plants growing in and characterizing a specific area or region; the combination of different plant communities found there.

vegetation type: A plant community with visually distinguishable characteristics, named for the apparent dominant species.

visibility: A measurement of the maximum distance to which large objects may be viewed. Fixed reference objects such as mountains, hills, towers, or buildings are normally used to estimate visibility.

visual range: The distance at which a black object (in practice, a distant mountain) becomes indistinguishable to an observer.

visual resource: The composite of basic terrain, geologic features, water features, vegetation patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for viewers.

Visual Resource Management (VRM): A system of visual management used by the BLM. The program has a dual purpose, to manage the quality of the visual environment and to reduce the visual impact of development activities while maintaining effectiveness in all Bureau resource programs. VRM also identifies scenic areas that warrant protection through special management attention. The system uses five classes for categorizing visual resources.

> **Class 1** - Natural ecological changes and very limited management activity are allowed. Any contrasts created within the characteristic landscape must not attract attention. This classification is applied to wilderness areas, wild and scenic rivers, and other similar situations.
>
> **Class 2** - Changes in any of the basic elements (form line, color, texture) caused by a management activity should not be evident in the characteristic landscape. Contrasts are seen, but must not attract attention.
>
> **Class 3** - Contrasts to the basic elements caused by a management activity are evident, but should remain subordinate to the existing landscape.
>
> **Class 4** - Any contrast attracts attention and is a dominant feature of the landscape in terms of scale, but it should repeat the form, line, color and texture of the characteristic landscape.
>
> **Class 5** - The classification is applied to areas where the natural character of the landscape has been disturbed to a point where rehabilitation is needed to bring it up to one of the four other classifications. The classification also applies to areas where unacceptable cultural modification has lowered scenic quality; it is often used as an interim classification until objectives of another class can be reached.

water bar: A ridge made across a hill to divert water to one side.

water quality: Refers to a set of chemical, physical, or biological characteristics that describe the condition of a river, stream, or lake. The quality of water determines which beneficial uses it can support. Different instream conditions or levels of water quality are needed to support different beneficial uses.

Waters of the United States: A jurisdictional term from Section 404 of the Clean Water Act referring to water bodies such as lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce.

watershed: A topographically delineated area that is drained by a stream system, that is, the total land area above some point on a stream or river that drains past that point.

wellbore: The diameter of the hole to be drilled.

well head: The equipment used to maintain surface control of a well. It is composed of the casing head, tubing head and a series of valves and fittings.

well pad: Relatively flat work area that contains equipment and facilities used for oil/gas production.

wetlands: Areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

wind rose: Any one of a class of diagrams designed to illustrate the distribution of wind direction experienced at a given location over a given period of time. Wind roses may also give information concerning distribution of wind speed, stability, or other meteorological parameters.

winter range: The place where migratory (and sometimes non-migratory) animals congregate during the winter season.

workover: Well maintenance activities that require onsite mobilization of a drill rig to repair the well bore equipment (casing, tubing, rods, or pumps) or the wellhead. In some cases, a workover may involve development activities to improve production from the target formation.

APPENDIX A

ACCEPTABLE PLAN CRITERIA:

Criteria for Meeting "Acceptable Plan" in Oil and Gas Lease Terms
Desolation Flats Natural Gas Project

APPENDIX A

Criteria for meeting "Acceptable Plan" in Oil and Gas Lease Terms
Desolation Flats Natural Gas Project

The following criteria are provided as guidance for preparing mitigative plans for any surface disturbing activity proposed in the Rock Springs portion of the DFPA. The Rock Springs portion of the DFPA lies within Class II visual resource management area and the area known as the Monument Valley Management Area. These criteria are not all inclusive but are identified as points that should be considered when developing such mitigative plans.

Disturbance Areas

1. Disturbance to pad locations and associated roads should be kept to the minimum needed to safely conducted operations.

2. Use of pad drilling (multiple wells at one surface site) when possible.

Transportation Planning

1. Keep miles of roads/trails to a minimum.

2. All roads should be designed by a professional engineer.

3. Roads should be engineered to avoid concentrating overland flow of water. Roads should be designed and placed to avoid drainage areas. If drainage areas cannot be avoided, then engineered with appropriate spacing of crossings with energy dispersion structures (i.e, armored low-water crossings).

4. Reduce cut and fill areas.

5. Reduce road standards when feasible (i.e., width).

6. Require durable surfacing (i.e, gravel). Gravel according to the transportation plan and Manual 9113 road standards.

7. Layout location of main roads (during transportation planning).

8. Maintenance including surveys of channel conditions below engineered portions of culvert discharges. Timely repair of problems when found.

Visual Resource Management (VRM) - VRM Class II

1. All disturbance would need to meet the Class II VRM objectives. The objective for Class II is to retain the existing character of the landscape. Level of change should be low. Activities may be seen but should not detract the attention of the casual observer. Any change must repeat the basic elements (line, form, color, texture) found in the predominant natural features of the characteristic landscape (Manual 8410-1).

2. Roads should be designed to avoid straight lines to protect the visual integrity of the Class II viewshed.

3. Pad locations should be hidden by topographical features.

4. Develop "key observation points" for individual actions and require visibility analysis modeling and/or photographic simulations.

5. Centralize production facilities whenever possible.

6. Screen locations where possible.

7. Reduce production facility dimensions (height, width, minimum needed to operate.

8. Use low contrast, non-reflective paint for production facilities.

9. Reduce contrast of base material color and texture (i.e., use of native gravel if available).

10. Follow topographic features (line, form) in order to reduce visibility of disturbance.

Reclamation

1. Reclamation will be done as soon as possible after disturbance and will be in accordance with the approved reclamation plan (as outlined in the EIS).

2. All actions will require an Erosion Control, Revegetation, and Restoration Plan (ERRP) and will conform to the Wyoming policy on reclamation.

3. Protect existing native vegetation.

4. Minimize disturbance of existing environment.

5. Soil stabilization via establishment of ground cover.

6. Establishment of native vegetation /site stabilization (3-5 years). Monitoring of reclamation success.

7. Use of native, certified weed-free seed.

8. Prompt treatment of noxious weed infestations.

9. Restore original contours on pad and road construction.

10. Leave surface as rough as possible.

Paleontological Resources

1. On-the-ground surveys will be required prior to any surface disturbing activity.

APPENDIX A - ACCEPTABLE PLAN CRITERIA

Cultural Resources

1. Follow BLM protocol for implementation of the Nationwide Programmatic Agreement.

2. Consultation with Native American groups should certain features be found (e.g. rock art, stone circles, burials, cairns, flat-top mesas.)

Geological Formations/Hazards (lease term)

1. Avoid slopes in excess of 25 percent

2. Avoid highly erosive areas.

Wildlife

1. Seasonal restriction for mule deer and antelope crucial winter range (11/15-4/30).

2. Avoid raptor concentration areas and seasonal restriction for individual raptor nests (2/1-7/31 nesting and 11/15 - 4/30 for winter concentration areas).

3. Mountain plover aggregation areas will be surveyed in accordance with the FWS's requirements for mountain plovers.

4. Prairie dog town/complexes where possible and if not avoided then cleared for black- footed ferrets.

5. Protection of migratory birds (pit netting).

Soils/Watershed

1. Construction with frozen material or during periods when the soil is saturated or when watershed damage is likely to occur is prohibited.

2. Avoid disturbance within 100 ft of inner gorge of intermittent or ephemeral drainages.

3. Require an erosion control plan.

4. Salvage and the subsequent replacement of topsoil whenever possible (topsoil depth to be determined case-by-case).

5. Avoid erosive soils when possible, otherwise design and construction should be done in such a manner to reduce erosion.

6. Construction across ephemeral drainages would be restricted until after spring runoff.

7. Reserve pits should not be located in areas where groundwater is less than 50 ft and soil permeability is greater than 10(-7) cm/hr.

8. Lining of pits should be decided on a case-by-case basis.

9. Seeding of borrow areas.

10. No surface disposal of produced water or surface discharge from water wells.

11. Pipeline placement will be determined based on site-specific conditions. Any surface pipelines crossing roads or trails will be buried. When buried pipelines are proposed, they will follow and be placed on the edge of roadways.

Scientific Values (RMP)

1. Protect integrity of paleontological and cultural values.

Other

1. Use of remote sensing devices to reduce number of well visits.

APPENDIX B

STANDARD MITIGATION GUIDELINES

APPENDIX B

STANDARD MITIGATION GUIDELINES

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APPENDIX B

STANDARD MITIGATION GUIDELINES

1.0 SURFACE DISTURBANCE MITIGATION GUIDELINE

Surface disturbance will be prohibited in any of the following areas or conditions. Exception, waiver, or modification of this limitation may be approved in writing, including documented supporting analysis, by the AO.

a. Slopes in excess of 25 percent.

b. Within important scenic areas (Class I and II Visual Resource Management Areas).

c. Within 500 feet of surface water and/or riparian areas.

d. Within either one-quarter mile or the visual horizon (whichever is closer) of historic trails.

e. Construction with frozen material or during periods when the soil material is saturated or when watershed damage is likely to occur.

1.1 Guidance

The intent of the SURFACE DISTURBANCE MITIGATION GUIDELINE is to inform interested parties (potential lessees, permittees, or operators) that when one or more of the five (1a through 1e) conditions exist, surface-disturbing activities will be prohibited unless or until a permittee or his designated representative and the surface management agency (SMA) arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur prior to development.

Specific criteria (e.g., 500 feet from water) have been established based upon the best information available. However, such items as geographical areas and seasons must be delineated at the field level.

Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of proposals (e.g., activity plans, plans of development, plans of operation, applications for permit to drill) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

2.0 WILDLIFE MITIGATION GUIDELINE

a. To protect important big game winter habitat, activities or surface use will not be allowed from November 15 to April 30 within certain areas encompassed by the authorization. The same criteria apply to defined big game birthing areas from May 1 to June 30.

Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the AO.

b. To protect important raptor and/or sage and sharp-tailed grouse nesting habitat, activities or surface use will not be allowed from February 1 to July 31 within certain areas encompassed by the authorization. The same criteria apply to defined raptor and game bird winter concentration areas from November 15 to April 30.

Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operation or production aspects.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the AO.

c. No activities or surface use will be allowed on that portion of the authorization area identified within (*legal description*) for the purpose of protecting (e.g., sage/sharp-tailed grouse breeding grounds, and/or other species/activities) habitat.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the AO

d. Portions of the authorized use area legally described as (*legal description*), are known or suspected to be essential habitat for (*name*) which is a threatened or endangered species. Prior to conducting any onsite activities, the lessee/permittee will be required to conduct inventories or studies in accordance with BLM and U.S. Fish and Wildlife Service guidelines to verify the presence or absence of this species. In the event that (*name*) occurrence is identified, the lessee/permittee will be required to modify operational plans to include the protection requirements of this species and its habitat (e.g., *seasonal use restrictions, occupancy limitations, facility design modifications that apply*).

2.1 Guidance

The WILDLIFE MITIGATION GUIDELINE is intended to provide two basic types of protection: 1) seasonal restriction (2a and 2b), and 2) prohibition of activities or surface use (2c). Item 2d is specific to situations involving threatened or endangered species. Legal descriptions will ultimately be required and should be measurable and legally definable. There are no minimum subdivision requirements at this time. The area delineated can and should be defined as necessary, based upon current biological data, prior to the time of processing an application and issuing the use authorization. The legal description must eventually become a part of the condition for approval of the permit, plan of development, and/or other use authorization.

The seasonal restriction section identifies three example groups of species and delineates three similar time frame restrictions. The big game species including elk, moose, deer, antelope, and bighorn sheep; all require protection of crucial winter range between November 15 and April 30. Elk and bighorn sheep also require protection from disturbance from May 1 to June 30, when they typically occupy distinct calving and lambing areas. Raptors include eagles, accipiters, falcons, (peregrine, prairie, and merlin), kestrels, buteos (ferruginous and Swainson's hawks), osprey, burrowing owls, and short-eared owls. The raptors and sage and sharp-tailed grouse require nesting protection between February 1 and July 31. The same birds often require protection from disturbance from November 15 through April 30 while they occupy winter concentration areas.

Item 2c, the prohibition of activity or surface use, is intended for the protection of specific wildlife habitat areas or values within the use area that cannot be protected by using seasonal restrictions. These areas or values must be factors that limit life-cycle activities (e.g., *sage grouse strutting grounds, known threatened and endangered species habitat*).

Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of proposals (e.g., activity plans, plans of development, plans of operation, applications for permit to drill) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

3.0 CULTURAL RESOURCE MITIGATION GUIDELINE

When a proposed discretionary land use has potential for affecting the characteristics which qualify a cultural property for the National Register of Historic Places (National Register), mitigation will be considered. In accordance with Section 106 of the Historic Preservation Act, procedures specified in 36 CFR 800 will be used in consultation with the Wyoming State Historic Preservation Officer and the Advisory Council on Historic Preservation in arriving at determinations regarding the need and type of mitigation required.

3.1 Guidance

The preferred strategy for treating potential adverse effects on cultural properties is "avoidance." If avoidance involves project relocation, the new project area may also require cultural resource inventory. If avoidance is imprudent or unfeasible, appropriate mitigation may include excavation (data recovery), stabilization, monitoring, protection barriers and signs, or other physical and administrative measures.

Reports documenting results of cultural resource inventory, evaluation, and the establishment of mitigation alternatives (if necessary) shall be written according to standards contained in BLM Manuals, the cultural resource permit stipulations, and in other policies issued by the BLM. These reports must provide sufficient information for Section 106 consultation. Reports shall be reviewed for adequacy by the appropriate BLM cultural resource specialist. If cultural properties on, or eligible for, the National Register are located within these areas of potential impact and cannot be avoided, the AO shall begin the Section 106 consultation process in accordance with the procedures contained in 36 CFR 800.

Mitigation measures shall be implemented according to the mitigation plan approved by the BLM AO. Such plans are usually prepared by the land use applicant according to BLM specifications. Mitigation plans will be reviewed as part of Section 106 consultation for National Register eligible or listed properties. The extent and nature of recommended mitigation shall be commensurate with the significance of the cultural resource involved and the anticipated extent of damage. Reasonable costs for mitigation will be borne by the land use applicant. Mitigation must be cost effective and realistic. It must consider project requirements and limitations, input from concerned parties, and be BLM-approved or BLM-formulated.

Mitigation of paleontological and natural history sites will be treated on a case-by-case basis. Factors such as site significance, economics, safety, and project urgency must be taken into account when making a decision to mitigate. Authority to protect (through mitigation) such values

is provided for in Federal Land Policy Management Act (FLPMA)(1976), Section 102(a)(8). When avoidance is not possible, appropriate mitigation may include excavation (date recovery), stabilization, monitoring, protection barriers and signs, or other physical and administrative protection measures.

4.0 SPECIAL RESOURCE MITIGATION GUIDELINE

To protect (*resource value*), activities or surface use will not be allowed (i.e., *within a specific distance of the resource value or between date to date*) in (*legal description*).

Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the AO.

4.1 Example Resource Categories (*Select or identify category and specific resource value*):

a. Recreation areas.

b. Special natural history or paleontological features.

c. Special management areas.

d. Sections of major rivers.

e. Prior existing rights-of-way.

f. Occupied dwellings.

g. Other (specify).

4.2 Guidance

The SPECIAL RESOURCE MITIGATION GUIDELINE is intended for use only in site-specific situations where one of the first three general mitigation guidelines will not adequately address the concern. The resource value, location, and specific restrictions must be clearly identified. A detailed plan addressing specific mitigation and special restrictions will be required prior to disturbance or development and will become a condition for approval of the permit, plan of development, or other use authorization.

Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of proposals (e.g., activity plans, plans of development, plans of operation, applications for permit to drill) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

APPENDIX B: STANDARD MITIGATION GUIDELINES

5.0 NO SURFACE OCCUPANCY GUIDELINE

No Surface Occupancy (NSO) will be allowed on the following described lands (*legal description*) because of (*resource value*).

5.1 Example Resource Categories (*Select or identify category and specific resource value*):

a. Recreation areas (e.g., campgrounds, historic trails, national, monuments).

b. Major reservoirs/dams.

c. Special management areas (e.g., areas of critical environmental concern, known threatened or endangered species habitat, wild and scenic rivers).

d. Other (specify).

5.2 Guidance

The NO SURFACE OCCUPANCY (NSO) MITIGATION GUIDELINE is intended for use only when other mitigation is determined insufficient to adequately protect the public interest and is the only alternative to "no development" or "no leasing." The legal description and resource value of concern must be identified and be tied to an NSO land use planning decision.

Waiver of, or exception(s) to, the NSO requirement will be subject to the same test used to initially justify its imposition. If, upon evaluation of a site-specific proposal, it is found that less restrictive mitigation would adequately protect the public interest or value of concern, then a waiver or exception to the NSO requirement is possible. The record must show that because conditions or uses have changed, less restrictive requirements will protect the public interest. An environmental analysis must be conducted and documented (e.g., environmental assessment, environmental impact statement, etc., as necessary) in order to provide the basis for a waiver or exception to an NSO planning decision. Modification of the NSO requirement will pertain only to refinement or correction of the location(s) to which it applied. If the waiver, exception, or modification is found to be consistent with the intent of the planning decision, it may be granted. If found inconsistent with the intent of the planning decision, a plan amendment would be required before the waiver, exception, or modification could be granted.

When considering the "no development" or "no leasing" option, a rigorous test must be met and fully documented in the record. This test must be based upon stringent standards described in the land use planning document. Since rejection of all development rights is more severe than the most restrictive mitigation requirement, the record must show that consideration was given to development subject to reasonable mitigation, including "no surface occupancy." The record must also show that other mitigation was determined to be insufficient to adequately protect the public interest, a "no development" or "no leasing" decision should not be made solely because it appears that conventional methods of development would be unfeasible, especially where an NSO restriction may be acceptable to a potential permittee. In such cases, the potential permittee should have the opportunity to decide whether or not to go ahead with the proposal (or accept the use authorization), recognizing that an NSO restriction is involved.

APPENDIX C

RECLAMATION PLAN

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RECLAMATION PLAN

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APPENDIX C

RECLAMATION PLAN

1.0 INTRODUCTION

The following erosion control, revegetation, mitigation measures, and management measures are designed to attain successful rehabilitation of disturbed areas associated with the DFPA Natural Gas Production project. These measures are designed to establish the feasibility of reclaiming disturbances associated with this project. The measures were developed based on 1) Bureau of Land Management (BLM) Wyoming State Office reclamation policy (USDI-BLM 1990b); 2) management directives presented in the Great Divide RMP (USDI-BLM 1988a,1990a) and Green River RMP (USDI-BLM 1996a, 1997); 3) impacts identified in the Environmental Consequences chapter (Chapter 4) of this environmental impact statement (EIS); 4) coordination with BLM staff; and 5) issues identified during the scoping process. The extent of possible disturbed areas to be reclaimed include the drill sites, access road, pipeline ROW's, and staging areas. The following measures apply to the Proposed Action and to Alternatives A and B unless identified for a specific alternative. The measures presented in this plan are designed to allow the project to be constructed without significant impacts to natural resources. Because of the large geographic area covered by the project and the lack of site-specific locations of project facilities, these measures are presented in a general, non-specific manner. Final selection of the measures to be applied at any given location, and modifications of these measures, will be identified by the BLM in coordination the Operators.

This reclamation plan outlines measures that will be taken to effectively reclaim areas disturbed during construction of the DFPA Natural Gas Production Project. These measures will be followed unless exceptions are granted or actions are modified by agreement between the BLM and the Operators. These measures describe how natural gas development activities should be managed to assure compliance with the resource management goals and objectives for the general area, applicable lease and unit area stipulations, and resource limitations identified during interdisciplinary (ID) team analyses. Initial monitoring for compliance and successful implementation of the mitigation measures will be under the direction of the Operators. Final approval and release will be under the direction of the BLM.

Reclamation measures covered in this plan fall into two general categories: temporary and final reclamation. Temporary reclamation refers to measures applied to stabilize disturbed areas and to control runoff and erosion during time periods when application of final reclamation measures is not feasible or practicable. Final reclamation refers to measures that should be applied concurrently with completion of drilling and pipeline installation.

Reclamation potential may be limited by salinity, alkalinity, steep slopes, shallow soils, depth to bedrock, low precipitation, stoniness, high wind and water erosion, periodic flooding, short growing season, seasonably high water tables, and strong winds. Special intensive land-use practices may be necessary to mitigate salt and sediment loading caused by surface-disturbing activities within the project area. Activity plans (e.g., applications for permit to drill [APD's]) should address site-specific problems, including monitoring for salt and sediment loading (USDI-BLM 1990b).

In general, temporary reclamation measures should be applied to all areas not promptly reclaimed to final conditions within a specified time period whether due to adverse weather conditions, inability to secure needed materials, and/or seasonal constraints, etc. Temporary reclamation measures should be applied only as needed; as in most cases, final reclamation measures should be applied

concurrently as sections of the project are completed. Temporary reclamation measures may be applied more rigorously to sensitive areas such as drainage channel crossings, steep slopes, and areas prone to high wind and water erosion. Temporary reclamation measures should include regrading the disturbed area to near pre-disturbance contour, re-spreading salvaged topsoil, mulching, and placing runoff and erosion control structures.

Final reclamation measures, in general, involve regrading the disturbed area to near pre-disturbance contour, re-spreading salvaged topsoil, applying soil amendments (if necessary), applying a prescribed seed mixture, mulching, and placing runoff and erosion control structures such as water bars and silt fences. The duration of the resultant impacts to the various vegetation community types depends in part on the success of implementation of the reclamation measures prescribed in this appendix and the time required for natural succession to return disturbed areas to pre-disturbance conditions after project completion.

Because wetlands are "waters of the U.S." and are therefore protected under the federal Clean Water Act (CWA), discharge of dredge or fill material into, and/or excavation of wetlands could require administrative coordination with the U.S. Army Corps of Engineers (COE) pursuant to the CWA and may require a Section 404 permit. The COE, based on the exact nature of the disturbance activity should determine the type of permit (Individual, Regional, or Nationwide) required according to the rules and regulations presented in the Federal Register (1986). Avoidance of waters of the U.S. and wetlands should be the highest priority. A suitable wetland mitigation plan should be developed for the areas of wetlands directly impacted due to project activities where avoidance is not practicable. Impact minimization should include reducing the area of disturbance in wetland areas as well as utilizing procedures specified by authorizing agencies to cross intermittent and ephemeral drainage channels and wetland areas.

Although intermittent and ephemeral drainage channels are not considered wetlands, the same requirements apply to the discharge of dredge and fill into them as for discharge into wetlands. Residual wetland impacts that could occur after maximum avoidance and/or impact minimization has been demonstrated should be mitigated according to the following order of priority: 1) avoidance; 2) impact minimization; 3) mitigation in-kind, on-site; 4) mitigation in-kind, off-site; 5) mitigation out-of-kind, on-site; and 6) mitigation out-of-kind, off-site. In addition, the following modes of mitigation could be implemented for wetland mitigation if avoidance and impact minimization were not feasible: 1) wetlands restoration; 2) wetlands creation; and 3) wetlands enhancement. The wetlands mitigation plan should be designed to replace the area of impact and functional values associated with the disturbed area.

Appropriate BLM and Natural Resources Conservation Service (NRCS) range conservationists were contacted to determine agency-specific seeding recommendations at drill sites and along access road and pipeline ROW's. The recommended seed mixtures in this plan were developed with input from these land management agencies. The reclamation measures in this report assume that baseline data would be collected in various areas along the access road and pipeline ROW's and at drill sites prior to construction activities by an authorized reclamation scientist.

2.0 OBJECTIVES

This plan is designed to meet the following objectives for reclamation of the access road/pipeline ROW's and the drill sites:

Short-Term (Temporary) Reclamation:

- Immediately stabilize the disturbed areas by mulching (if needed), providing runoff and erosion control, and through the establishment of new vegetation (required for problem areas; may be optional for other areas depending on consultation with the BLM).
- Control and minimize surface runoff, erosion, and sedimentation through the use of diversion and water treatment structures.

Long-Term (Final) Reclamation:

- Immediately stabilize the disturbed soil surface by mulching (if needed and as directed by the BLM), runoff and erosion control, and through the establishment of new vegetation. Adequate surface roughness should exist to reduce runoff and to capture rainfall and snow melt.
- Control and minimize surface runoff, erosion, and sedimentation through the use of diversion and water treatment structures.
- Restore primary productivity of the site and establish vegetation that will provide for natural plant and community succession.
- Establish a vigorous stand of desirable plant species that will limit or preclude invasion of undesirable species, including invasive, non-native species.
- Revegetate the disturbed areas with native plant species useful to wildlife and livestock.
- Enhance aesthetic values. In the long-term, reclaimed landscapes should have characteristics that approximate the visual quality of adjacent areas, including location, scale, shape, color, and orientation of major landscape undisturbed features.

3.0 PERFORMANCE STANDARDS

The following performance standards should be used to determine the attainment of successful revegetation:

All Years:

- Protective cover. With the exception of active work areas, all disturbed highly erosive or sensitive areas to be left bare, unprotected, or unreclaimed for more than one month will have at least a 50 percent cover of protective material in the form of mulch, matting, or vegetative growth. All disturbed areas should have at least a 50 percent cover of protective material within six months after reclamation.

Second Year (Final Reclamation):

- Seedling density. The density and abundance of desirable species is at least three to four seedlings per linear foot of drill row (if drilled) or transect (if broadcast). Vegetative transects will be established on a permanent basis so that transects can be measured annually through the five year monitoring period.

- Percent cover. Total vegetal cover will be at least 50 percent of predisturbance vegetal cover as measured along the reference transect for establishing baseline conditions.

By the Fifth Year (Final Reclamation):

- Percent cover. Total vegetal cover will be at least 80 percent of predisturbance vegetal cover as measured along the reference transect for establishing baseline conditions.

- Dominant species. Ninety percent of the revegetation consists of species included in the seed mix and/or occurs in the surrounding natural vegetation, or as deemed desirable by the BLM as measured along the reference transect for establishing baseline conditions.

- Erosion condition/soil surface factor. Erosion condition of the reclaimed areas is equal to or in better condition than that measured for the reference transect for establishing baseline conditions.

4.0 METHODS

4.1 Drill Site, Access Road, and Pipeline Right-of-Way Clearing and Topsoil Removal and Storage

Topsoil should be handled separately from subsoil materials. At all construction sites, topsoil should be stripped to provide for sufficient quantities to be respread to a depth of at least four to six inches over the disturbed areas to be reclaimed. In areas where deep soils exist (such as floodplains and drainage channel terraces), at least 12 inches of topsoil should be salvaged. Where soils are shallow or where subsoil is stony, as much topsoil should be salvaged as possible. Topsoil should be stockpiled separately from subsoil materials. Topsoil salvaged from drill sites and stored for more than one year should be bladed to a specified location at these areas, seeded with a prescribed seed mixture, and covered with mulch for protection from wind and water erosion and to discourage the invasion of weeds. Topsoil stockpiles should not exceed a depth of 2-feet. Topsoil should be stockpiled separately from other earth materials to preclude contamination or mixing and should be marked with signs and identified on Construction and Design plans. Runoff should be diverted around topsoil stockpiles to minimize erosion of topsoil materials. In most cases, disturbances will be reclaimed within one year. Therefore, it is unlikely that topsoil stockpiling for more than one year will be required. Salvaged topsoil from roads and drill sites will be respread over cut-and-fill surfaces not actively used during the production phase. Upon final reclamation at the end of the project life, topsoil spread on these surfaces will be used for the overall reclamation effort.

Operators are finding out that it is not always necessary to remove all vegetation and strip all topsoil within a pipeline ROW. In many areas, such as with deep soils on relatively flat smooth slopes with low gradients, it is possible to crush in-place rather than clear vegetation and leave topsoil in-place rather than blade and stockpile. This technique would reduce the magnitude and severity of disturbance impacts and hasten successful reclamation.

In federal jurisdictional wetland areas, vegetation should be cut off only to the ground level, leaving existing root systems intact. Cut vegetation should be removed from wetland areas for disposal. Grading activities should be limited to directly over pipeline trenches and access roads. At least 12 inches of topsoil should be salvaged and replaced except in areas with standing water or saturated soils. Use of construction equipment in wetland areas should be limited. Dirt, rockfill, or brush riprap should not be used to stabilize pipeline ROW's. If standing water or saturated soils are present, wide-track or balloon-tire construction equipment should be used or normal construction equipment should be operated on equipment pads or geotextile fabric overlain with gravel fill. Equipment pads etc., should be removed immediately upon completion of construction activities. Trench spoil should be placed at least 10 feet away from drainage channel banks for all minor and major drainage channel crossings.

4.2 Drill Site, Access Road, and Pipeline Right-of-Way Construction

4.2.1 Upland Areas

Uplands include all areas away from wetlands and alluvial bottomlands or other areas that have excess soil moisture for prolonged periods or have shallow water tables. Construction should be accomplished following site-specific Construction and Design plans and applicable agency specifications. At drill sites, and along the areas of access road or pipeline ROW traversing steep slopes, slope angles should be minimized to enhance retention of topsoil, and reduce erosion as well as facilitate revegetation, and subsequent reclamation success. Slope stabilizing revetment structures may be necessary in areas where the substrata materials are unconsolidated and loose and cannot be stabilized with revegetation and mulch.

Surface runoff should be controlled at all well sites through the use of interception ditches and berms. A berm approximately 18 inches high should be constructed around fill portions of these well sites to control and contain all surface runoff generated or fuel or petroleum product spills on the pad surface. Water contained on the drill pads should be treated in a detention pond prior to discharge into undisturbed areas in the same manner as discussed previously. This system should also serve to capture fuel and chemical spills, should they occur.

Erosion and sedimentation control measures and structures should be installed on all disturbed areas. Soil erosion control should be accomplished on sites in highly erosive soils and steep areas with mulching, netting, tackifiers, hydromulch, matting, and excelsior. The type of control measure should depend on slope gradients and the susceptibility of soil to wind and water erosion. Silt fences should be placed at the base of all steep fill slopes and sensitive disturbed areas. All runoff and erosion control structures should be inspected periodically, cleaned out, and maintained in functional condition throughout the duration of construction and drilling. Water bars should be constructed on cut-and-fill slopes exceeding 25 feet long and 10 percent gradient using the water bar spacing guidelines and procedures specified for access road and pipeline ROW runoff and erosion control (BLM Manual 9113).

Runoff and erosion control along access road/pipeline ROW'S should be accomplished by implementing standard cross drain, culvert, road ditch, and turnout design as well as timely mulching and revegetation of exposed cut, fill, and road shoulders. All culverts should be constructed with riprapped entrances and exits and with energy dissipaters or other scour- reducing techniques where appropriate. Water discharged from culverts, cross drains, road ditches and turnouts should be directed into undisturbed vegetation away from all natural drainages. Erosion and sedimentation control measures and structures should be installed across all cut-and-fill slopes within 100 feet of drainage channels. All runoff and erosion control structures should be inspected after major runoff events and at a regular schedule. If found to be sub-standard, these structures should be cleaned out and maintained in functional condition throughout the life of the project.

4.2.2 Drainage Channel Crossings

Construction of drainage channel crossings should minimize the disturbance to drainage channels and wetlands to the extent practicable and should occur during the low runoff period (June 15 through March 1). Staging areas should be limited in size to the minimum necessary and should be located at least 50 feet from drainage channel bottoms, where topographic conditions permit. Hazardous materials should not be stored and equipment should not be refueled within 100 feet of drainage channels. Drainage channel crossings should be constructed as perpendicular to the axis of the drainage channel and at the narrowest positions as engineering and routing conditions permit. Clean gravel should be used for the upper one foot of fill over the backfilled pipeline trenches within drainage channel crossings.

4.2.3 Wetlands

Access roads and pipelines should be rerouted, and drill sites located, to avoid wetland areas to the maximum extent practicable. The size of staging areas should be limited to the minimum necessary and all staging areas should be located at least 50 feet from the edge of federally delineated wetland areas, where topographic conditions permit. The width of the access road and pipeline construction ROW should be limited to no more than 50 feet. Hazardous materials should not be stored and equipment should not be refueled within 100 feet of wetland boundaries.

Appropriate permits should be secured from the COE prior to any construction activities in federal jurisdictional wetland areas.

4.3 Surface Runoff and Erosion Control

4.3.1 Drill Site, Access Road, and Pipeline Right-of-Way

4.3.1.1 Temporary Reclamation

Temporary erosion control measures may include application of mulch and netting of biodegradable erosion control blankets stapled firmly to the soil surface, respreading scalped vegetation, or construction of water bars. See Final Reclamation measures (Section 4.4) for specific information pertaining to mulching.

The actual distance of a pipeline/road ROW requiring stabilization on each side of a drainage channel should be determined on a site-specific basis. To minimize sedimentation of drainage channels and wetlands during the interim period between construction activity and final reclamation,

temporary erosion and sediment control measures should be applied. Silt fences or other sediment filtering devices such as weed-free straw bales should be installed along drainage channel banks where sedimentation is excessive and at the base of all slopes adjacent to wetlands. Figure C-1 presents schematics of water bar and silt fence construction. Sediment filtering devices should be cleaned out and maintained in functional condition throughout the life of the project. To avoid the possibility of mulching materials entering waterways, loose mulch (i.e., mulch not crimped into the soil surface, tackified, or incorporated into erosion control blankets) should not be applied to drainage channel banks.

If construction is completed more than 30 days prior to the specified seeding season for perennial vegetation, areas adjacent to the larger drainage channels should be covered with jute matting for a minimum of 50 feet on either side of the drainage channel. In addition, to protect soil from raindrop impact and subsequent erosion, 2.0 tons/acre of a weed-free straw mulch should be applied to all slopes greater than 10 percent. Temporary erosion control measures may include leaving the ROW in a roughened condition, respreading scalped vegetation, or applying mulch. As indicated by several operators and the BLM, weed-free straw mulch is difficult to obtain in quantities and at costs suitable for all reclamation applications. Although this circumstance could reduce the application of the measure, the effectiveness of mulch in protecting the exposed soil from raindrop impact, erosion, and off-site sedimentation should not be ignored. In addition to its effectiveness in erosion control, mulching also benefits the soil as a plant growth medium in many cases. Therefore, effective mulching is fundamental to reducing soil erosion to acceptable, non-significant levels.

Trench breakers should be used for pipeline construction in certain areas to prevent the flow of water in either a trench that has been backfilled or temporarily left open. Trench breakers are particularly important in wetland areas to minimize subsurface drainage. Trench breakers should be constructed such that the bottom of one breaker is at the same elevation as the top of the next breaker down slope, or every 50 feet, whichever is greater. Factors that control the application of trench breakers include the proximity to drainage channels and wetland areas, slope gradient, proximity of areas to shallow groundwater, and surface runoff source areas that can discharge water into the trench. Trench breakers should be installed, where necessary. Topsoil should not be used to construct trench breakers.

If a pipeline crosses roads at the base of slopes, vegetative strips should be maintained. If vegetation is disturbed within these limits, temporary sediment barriers such as silt fences and/or staked weed-free straw bales should be installed at the base of the slope adjacent to the road crossing. Temporary sediment barriers should remain in-place until permanent revegetation measures have been judged successful.

4.3.1.2 Final Reclamation

4.3.1.2.1 Upland Areas

Runoff and erosion control along all ROW'S should be accomplished by constructing sediment trapping devices (e.g., silt fences and straw bales) and water bars, as well as by timely mulching and revegetation of exposed disturbed areas. Runoff discharged from water bars should be directed into undisturbed vegetation away from all natural drainages. Erosion and sedimentation control measures and structures should be installed across all cut-and-fill slopes. All runoff and erosion control structures should be inspected after major runoff events and on a regular schedule.

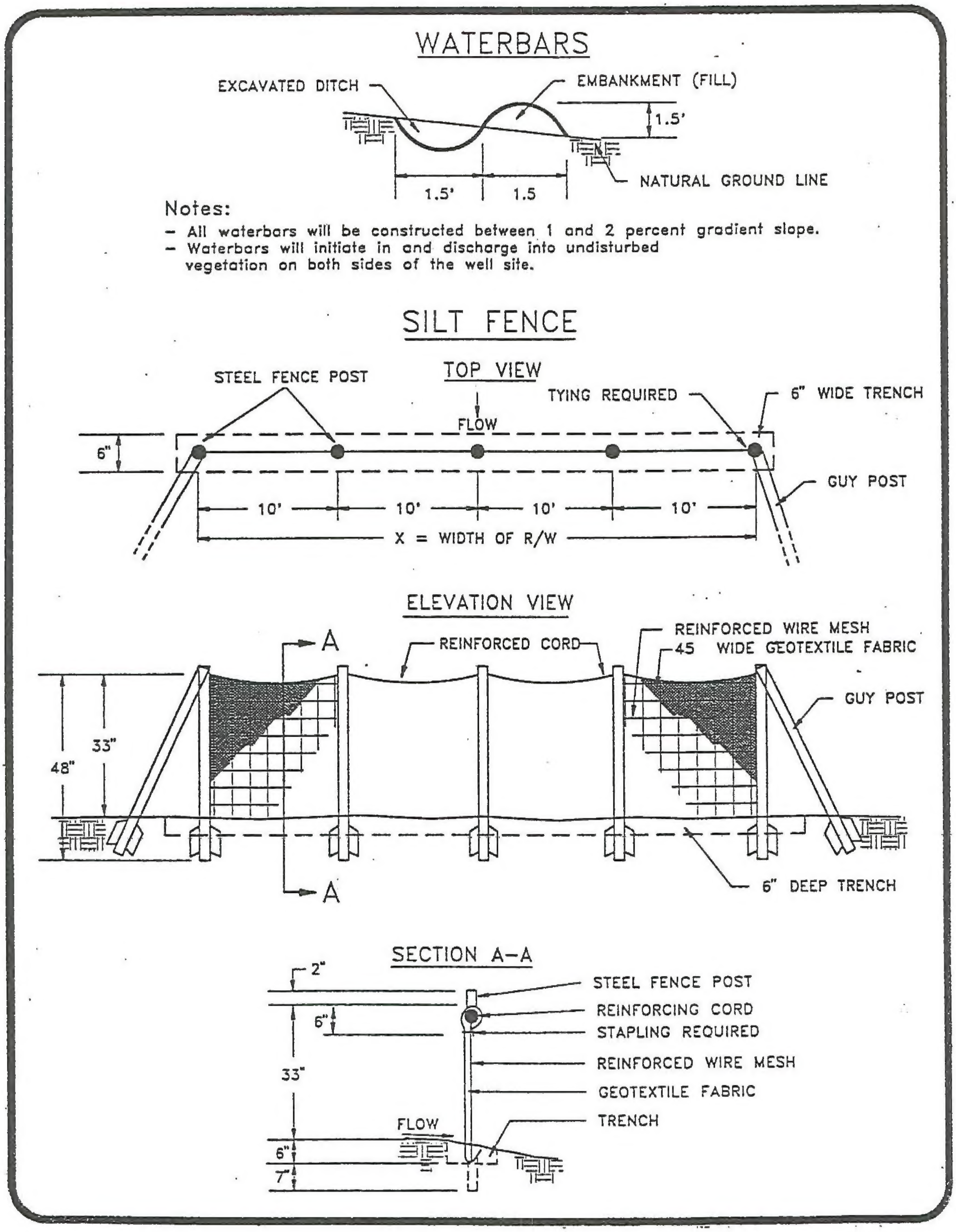

Figure C-1. Water Bar Construction and Silt Fence Construction.

If found to be substandard or ineffective, these structures should be cleaned out and maintained in functional condition until successful revegetation and soil stability is attained.

Water bars should be constructed across sideslopes at appropriate intervals according to slope gradient immediately following recontouring of the disturbed areas. The spacing should depend on whether mulching is applied in conjunction with placement of water bars. Water bars should be maintained in functional condition throughout the life of the project. Should the integrity of the water bar system be disrupted during seeding, water bars should be repaired and broadcast seeded with the seed raked into the soil. Water bars should be constructed according to hillslope topography at the slope gradient intervals as shown in Table C-1.

Water bars should be constructed 12 to 18 inches deep by digging a small trench and casting the soil material to the downhill side in a row. Each water bar should initiate in undisturbed vegetation upslope, traverse the disturbed area perpendicular to the ROW at a gradient between one and two percent, and discharge water into undisturbed vegetation on the lower side of the disturbed area.

Table C-1. Water Bar Intervals According to Slope Gradient[1].

With Mulching		Without Mulching	
Slope Gradient (percent)	**Interval (feet)**	**Slope Gradient (percent)**	**Interval (feet)**
10	150	10	100
15	100	15	75
20	50	20	45
30	40	30	40
40	35	40	35
50	30	50	30
>50	30	>50	30

1 Based on Grah (1989).

4.3.1.2.2 Wetlands and Drainage Channel Crossings

Disturbance to the ephemeral and intermittent drainage channels should be avoided and/or minimized. All channel crossings not maintained for access roads should be restored to near predisturbance conditions. Drainage channel bank slope gradients should be regraded to conform with adjacent slope gradients. Channel crossings should be designed to minimize changes in channel geometry and subsequent changes in flow hydraulics. Culverts should be installed for ephemeral and intermittent drainage channel crossings. All drainage channel crossing structures should be designed to carry the 25- to 50-year discharge event as directed by the BLM. Silt fences should be constructed at the base of slopes at all drainage channel crossings. Minor routing variations should be implemented during access road, pipeline, and drill site layout to avoid washes. The area of disturbance in the vicinity of washes should be minimized. Per the Great Divide Resource Area Resource Management Plan (RMP), a 500-foot-wide buffer strip of natural vegetation should be maintained between all construction activities and drainage channels.

Trench plugs should be employed at non-flumed drainage crossings to prevent diversion of drainage channel flows into upland portions of pipeline trenches during construction. Application of riprap should be limited to areas where flow conditions prevent vegetative stabilization; riprap

activities must comply with COE permit requirements. Pipeline trenches should be dewatered in such a manner that no silt laden water flows into active drainage channels (i.e., prior to discharge the water should be filtered through a silt fence, weed-free straw bales, or allowed to settle in a sediment detention pond).

4.4 Final Reclamation

4.4.1 Topsoil Respreading and Seedbed Preparation

In preparation for seeding, topsoil that was initially removed should be evenly spread over the pipeline ROW, staging areas, cut-and-fill surfaces, and all areas of other sites not required for production purposes.

Soil compaction could result from heavy equipment working on disturbed soils prior to revegetation. Therefore, compaction is likely to occur under most situations. Soil compaction can inhibit adequate revegetation of disturbance areas. Therefore, all disturbances to be revegetated will be ripped to reduce the adverse effect of compaction. All disturbed areas should be ripped on 18- to 26-inch spacing and 12 to 16 inches deep. A spring tooth harrow equipped with utility or seedbed teeth, or ripper-teeth equipment mounted behind a large crawler tractor or patrol should be used to loosen the subsoil. The subsoil surface should be left rough. After topsoil has been respread and if it is loose, it should be compacted with a cultipacker or similar implement to provide a firm seedbed. On steep slopes (greater than 40 percent and highly erosive), it may be difficult or impossible to replace topsoil and adequately prepare the seedbed. The disturbed areas on steep slopes should be ripped as described above. These areas should then be mulched with a hydromulch/seed/tackifier mix. Erosion control blankets with seed incorporated into the matting should be installed per manufacturer's specifications to enhance soil stabilization.

4.4.2 Seed Application

Upon completion of final grading, soil surfaces should either be seeded, or erosion control measures should be used until the site is seeded. Late fall is typically a good time of year to seed, however timing of seeding should be adjusted depending upon weather, soil moisture conditions and the plant species being used. The seedbed should be prepared to a depth of three to four inches where possible to provide a firm seedbed. If hydroseeding or broadcast seeding is employed, the seedbed should be scarified to ensure good seed-soil contact. After completion of seedbed preparation, the seed mixtures presented in Tables C-2 through C-5, or a similar mix should be applied according to the pure live seed (PLS) rates and drilling depths specified, to areas along the road and pipeline ROW, staging areas, and unused areas of drill sites that have been retopsoiled.

Seed should be used within 12 months of viability testing. Legume species purchased commercially must have been properly inoculated with nitrogen-fixing bacteria. Seed should be planted in the fall (after September 31) or no later than late fall (mid-November) prior to snow accumulation to avoid seed germination and breaking of dormancy and to prevent seedling frost damage; or in early Spring (prior to May 15). Seed should preferably be planted with drill-type equipment such as a rangeland drill or brillion seeder. Where the microtopography of the disturbed areas does not allow drill-type equipment, seed should be broadcast applied at twice the application rate of drilled seed. A spike-toothed harrow or similar equipment should be used where ripping has been insufficient to provide cover for the broadcast seed.

Any soil disturbance that occurs outside the recommended permanent seeding season, or any bare soil left unstabilized by revegetation, should be treated as a winter-construction problem and mulching should be considered, or the site stabilized.

The seed mixtures presented in Tables C-2 through C-5, or similar mixtures should be applied according to specific areas identified to be homogeneous in terms of overall ecosystem similarities such as precipitation zones, elevational zones, dominant species herbaceous cover, soil types, and inherent limitations in reclamation success potential. Specifically, Seed Mixture #1 (Table C-2) should be applied to disturbances in the sagebrush-dominated mixed desert shrub and juniper woodland community types. Seed Mixture #2 (Table C-3) should be applied to disturbances in the more moist alkaline mixed desert shrub community types. Seed Mixture #3 (Table C-4) should be applied to greasewood-dominated mixed desert shrub communities in alkaline valley bottoms and bluffs. Seed Mixture #4 (Table C-5) should be applied to disturbances in wet meadow community types. These seed mixes were developed based on the following criteria: 1) site-specific conditions of the analysis area; 2) usefulness of species in rapid site stabilization; 3) species success in revegetation efforts; and 4) current seed costs and availability. Native plant species should be used, and final seed mixes applied in the revegetation effort should be designed in coordination with the BLM.

Final determination of the appropriate seed mixture should be developed on a site-specific basis at the time of field review of the facility. Seeding rates may be varied to enhance the probability for maintaining the natural balance of species. Watershed protection must be emphasized when reclaiming disturbed areas. The composition of rare and native species, if encountered, should be taken into consideration at the time of seeding; however, appropriate measures must be taken to ensure that an adequate protection of the soil surface is maintained. Areas not exhibiting successful revegetation throughout the entire area disturbed by the project should be re-seeded until an adequate cover of vegetation is established. Private and agricultural lands should be seeded with similar seed mixes unless the landowner requests different mixes.

4.4.3 Mulching

In sensitive sites where significant erosion (e.g., large areas of disturbance or areas with high erosion rates) is most likely to occur, the seeded access road/pipeline ROW, staging areas, and the portion of the drill pads not needed for production purposes should be mulched following seeding to protect the soil from wind and water erosion, raindrop impact, surface runoff, and invasive, non-native species invasion, and to hold the seed in place. The exposed surface of disturbed areas, including topsoil stockpiles, may be protected by placing crimped straw mulch, hydromulch, biodegradable plastic netting and matting, or biodegradable erosion control blankets.

All sensitive disturbed areas should be mulched immediately following seeding with 1.5 to 2.0 tons/acre of a weed-free straw mulch. Mulching materials should be free of invasive, non-native species and undesirable plant species as defined by state or county lists. Hay mulch may be used, but it should be applied only if cost-competitive and if crimped into the soil. Straw mulch is more desirable than hay mulch because it is generally less palatable to wild horses, wildlife, and livestock. Additionally, there tends to be a higher risk of introducing undesirable species and invasive, non-native species with a hay mulch such as smooth brome, timothy, orchardgrass and other minor species. The lessee should maintain all disturbances relatively weed-free for the life of the project through implementation of an invasive, non-native species monitoring and eradication program.

Table C-2. Seed Mixture[1] #1 - Mixed Desert Shrub, Badlands, and Juniper Woodland Community Types.

Species	Cultivar or Variety	Seed Application Drilled Rate (pls[2] lbs/ac)	Planting Depth (if drilled) (inches)
Grasses			
Western wheatgrass (*Agropyron smithii*)	Rosanna	2.0	0.5
Bluebunch wheatgrass (*Agropyron spicatum*)	Secar	2.0	0.5
Bottlebrush squirreltail (*Sitanion hystrix*)	-	2.0	0.5
Indian ricegrass (*Oryzopsis hymenoides*)	Nezpar	2.0	0.5
Needle-and-Thread (*Stipa comata*)	-	2.0	0.5
Forbs			
Gooseberryleaf globemallow (*Sphaeralcea grossulariaefolia*)	-	1.0	0.5
Cicer milkvetch (*Astragalus cicer*)	Monarch	1.0	0.5
Shrubs			
Wyoming big sagebrush (*Artemisia tridentata*)	-	0.5	0.25
Antelope bitterbrush (*Purshia tridentata*)	-	1.0	0.5
Fourwing saltbush (*Atriplex canescens*)	-	1.0	0.5
TOTAL		**14.5**	

[1] Seed mix based on adaptation to the site conditions of the project, usefulness of species for rapid site stabilization, species success in revegetation efforts, and current seed availability and cost.

[2] PLS = pure live seed.

Table C-3. Seed Mixture[1] #2 - Moist Alkaline Areas in the Mixed Desert Shrub Community Type.

Species	Cultivar or Variety	Seed Application Drilled Rate (pls[2] lbs/ac)	Planting Depth (if drilled) (inches)
Grasses			
Spike Muhly (*Muhlenbergia wrightii*)	El Vado	2.0	0.5
Alkaligrass (*Pucinellia distans*)	Fults	5.0	0.5
Alkali sacaton (*Sporobolus airoides*)	Salado	3.0	0.5
Forbs			
Strawberry clover (*Trifolium fragiferum*)	O'Connors, Salina	2.0	0.5
Shrubs			
Fourwing saltbush (*Atriplex canescens*)	-	1.0	0.5
Shadscale (*Atriplex confertifolia*)	-	1.0	0.5
TOTAL		**14.0**	

[1] Seed mix based on adaptation to the site conditions of the project, usefulness of species for rapid site stabilization, species success in revegetation efforts, and current seed availability and cost.

[2] PLS = pure live seed.

Table C-4. Seed Mixture[1] #3 - Greasewood-Dominated Valley Bottoms and Bluffs.

Species	Cultivar or Variety	Seed Application Drilled Rate (pls[2] lbs/ac)	Planting Depth (if drilled) (inches)
Grasses			
Western wheatgrass (*Agropyron smithii*)	Rosanna	3.0	0.5
Pubescent wheatgrass (*Agropyron tricophorum*)	Luna	2.0	0.5
Alkali sacaton (*Sporobolus airoides*)	-	2.0	0.25
Russian wildrye (*Elymus junceus*)	Vinall	2.0	0.25
Forbs			
Cicer milkvetch (*Astragalus cicer*)	Monarch	3.0	0.5
Shrubs			
Fourwing saltbush (*Atriplex canescens*)	-	1.0	0.5
Gardner saltbush (*Atriplex gardneri*)	-	1.0	0.5
Winterfat (*Ceratoides lanata*)	-	1.0	0.5
TOTAL		**15.0**	

1 Seed mix based on adaptation to the site conditions of the project, usefulness of species for rapid site stabilization, species success in revegetation efforts, and current seed availability and cost.

2 PLS = pure live seed.

Table C-5. Seed Mixture[1] #4 - Wet Meadow Community Types.

Species	Cultivar or Variety	Seed Application Drilled Rate (pls[2] lbs/ac)	Planting Depth (if drilled) (inches)
Grasses			
Spike muhly (*Muhlenbergia wrightii*)	El Vado	2.0	0.5
Redtop (*Agrostis stolonifera*)	-	1.0	0.5
Tufted hairgrass (*Deschampsia cespitosa*)	-	4.0	0.25
Forbs			
Red clover (*Trifolium pratense*)	Kenland	2.0	0.5
Strawberry clover (*Trifolium fragiferum*)	O'Connors, Salina	2.0	0.5
TOTAL		**13.0**	

[1] Seed mix based on adaptation to the site conditions of the project, usefulness of species for rapid site stabilization, species success in revegetation efforts, and current seed availability and cost.

[2] PLS = pure live seed.

Wherever utilized, mulch should be spread uniformly so that at least 75 percent of the soil surface is covered. If a mulch blower is used, the straw strands should not be shredded less than eight inches in length to allow effective anchoring. On slopes less than 30 percent, straw mulch should be applied by a mechanical mulch blower at a rate of 2.0 tons/acre after seeding. The mulch should be crimped into the soil surface using a serrated disc crimper. Where broadcast straw mulch is applied on windswept slopes, a biodegradable plastic netting should be staked firmly to the soil surface over the mulch following the manufacturer's specifications. On slopes in excess of 40 percent or on slopes exceeding the operating capabilities of machinery, hydromulch or biodegradable erosion control blankets with seed incorporated into the netting should be applied and staked firmly to the soil surface.

Where utilized, hydromulch and tackifier should be applied at a rate of 1,500 lbs/acre. In general, erosion control and soil stabilization are directly related to the amount of mulch applied. Under certain conditions where degradation processes are slow (e.g., in extremely hot or cold dry climates), a trade-off between the degree of effectiveness of mulch and long-term degradation should be considered. In extremely dry areas where mulch degradation may be slow, mulching rates should be reduced to 1.0 to 1.5 tons/acre. Special measures may need to be implemented in areas with sandy soils.

On steeper slopes with highly erodible, shallow, rocky soils and/or on windswept areas with loose, unconsolidated materials, the above recommended measures may not be sufficient to reduce erosion to non-significant levels. The following measure should be considered by the operator and the BLM to stabilize such sites: incorporating a custom blend of seed into erosion control blankets. This method has proven cost-effective in many cases, with 98 percent of the cost being the blanket itself. The additional cost of incorporating seed into the blanket will average \$1.00 to \$1.50 per blanket, depending upon current seed costs. In most cases, this additional cost should offset the repeated efforts of broadcast seeding, manual raking of seeds into the soil, and mobilizing a labor force. The final measure(s) to be implemented in such areas should be determined by agreement between the BLM and Operators.

4.4.4 Livestock Control

Livestock grazing should be monitored on and along all drill sites, access road, and pipeline ROW's. Should grazing negatively impact revegetation success, measures should be taken to immediately remove livestock from the newly reclaimed areas. Depending upon site-specific evaluations, it may be necessary to temporarily fence off certain riparian areas and wetlands to prevent excessive livestock grazing and trampling to enhance drainage channel bank stabilization and overall revegetation success. Existing livestock control structures such as fences and cattle guards should be maintained in functional condition during all phases of the project. Where access requires the disruption of an existing fence, a cattle guard should be installed at the junction.

4.4.5 Off-Road Vehicle Control

Off-road vehicle control measures should be installed and maintained following the completion of seeding. Examples of practicable measures include a locking, heavy steel gate with fencing extending a reasonable distance to prevent bypassing the gate, with appropriate signs posted; a slash and timber barrier; a pipe barrier; a line of boulders; or signs posted at all points of access at intervals not to exceed 2,000 feet indicating "This Area Seeded for Wildlife Benefits and Erosion Control."

4.4.6 Fugitive Dust Control

Should fugitive dust generated during construction of the drill sites, access road/pipeline ROW'S, or staging areas become a problem, dust abatement measures should be implemented. Such procedures could include applying water or water with additives (e.g., magnesium chloride) to the construction area at regular intervals.

4.5 Monitoring and Maintenance

4.5.1 General

A designated official or responsible party should annually inspect and review the condition of all drill sites, access road/pipeline ROW'S, and any other disturbed areas associated with the project. This official should assess the success of and prognosis for all runoff and erosion control and revegetation efforts, evaluate fugitive dust control needs, and recommend remediation measures, if necessary. In addition, monitoring should take place following each major runoff event. Photographs should be taken at drill sites and along access roads at specific areas each year to document the progress of the reclamation program at established photomonitoring points.

The following specific items should be monitored during inspections:

- revegetation success;
- sheet and rill erosion, gullies, slumping, and subsidence;
- soundness and effectiveness of erosion control measures;
- sediment filtering devices along all active ephemeral and intermittent drainage channels;
- water quality and quantity;
- invasive, non-native species invasion;
- degree of rodent damage on seed and seedlings;
- locations of unauthorized off-highway vehicle (OHV) access;
- soundness and effectiveness of OHV control structures;
- evidence of livestock or wildlife grazing; and
- overgrazing/trampling of riparian and wetland areas.

4.5.2 Reclamation Success Monitoring

Reclamation success should be based upon the objectives specified in this plan; therefore, monitoring should be tied to these objectives. The actual monitoring procedures for quantitative and qualitative evaluations of reclamation success should be implemented as specified by the BLM or other authorizing agencies.

Reclamation success should be monitored both in the short term (temporary reclamation) and in the long term (final reclamation). Monitoring of temporary reclamation measures should include visual observations of soil stability, condition, and effectiveness of mulching and runoff and erosion control measures and a quantitative and qualitative evaluation of revegetation success, where appropriate. Long-term reclamation monitoring should include visual observations of soil stability, condition of the effectiveness of mulching and runoff and erosion control measures, and a quantitative and qualitative evaluation of revegetation success.

Revegetation success should be determined through monitoring and evaluation of percent ground cover to include a measure of vegetal cover (by species), litter/mulch, rock/gravel, and bare ground. Ground cover should be documented at each 1-foot interval along a 100-foot line intercept transect. Seedling density and relative abundance should be determined by selection of plots at the 20-, 40-, 60-, and 80-foot marks on the transect. Grazing impacts should be assessed as an ocular estimate of the percent utilization along the transect.

Soil stability should be measured using an erosion condition class/soil surface factor rating method to numerically rate soil movement, surface litter, surface rock, pedestalling, flow patterns, and rill-

gully formation. Information obtained through this rating system represents an expression of current erosion activity and can be used to reflect revegetation success as a function of soil stability.

The access road boundaries, pipelines, and unused portions of the drill sites should be monitored until attainment of 80 percent of predisturbance vegetative cover within five years of seeding. This standard should include 90 percent of the vegetative cover being comprised of desirable species and the erosion condition of the reclaimed area being equal to or in better condition than predisturbance conditions as prescribed under the Performance Standard section of this plan.

4.5.3 Wetland and Drainage Channel Crossings

Wetland areas and natural drainage channel crossings should be monitored for a minimum of three years for invasive, non-native species invasion and establishment of undesirable species. Invasive, non-native species should not be allowed to establish at any time. If found in a reclaimed wetland or drainage channel crossing, the invasive, non-native species should be removed. Undesirable species should not be allowed to establish. At the third year of monitoring, presence of undesirable species should be negligible. The lessee should maintain wetland areas and drainage channel crossings according to this standard throughout the development of an invasive, non-native species and undesirable species monitoring and eradication program.

4.5.4 Photomonitoring

Permanent photomonitoring points should be established at appropriate vantage locations that provide adequate visual access to drill sites, along pipeline and access road rights-of-way, and to ancillary facilities. Each photomonitoring point should be permanently marked with re-bar and identified on a topographic map of the area. The location of each point should be described in detail to assist in relocation from year to year. Photos should be taken at each photomonitoring point prior to initiation of construction. Photos, framing the same scene as previously taken, should be taken each year until reclamation standards have been met.

APPENDIX D

HAZARDOUS MATERIALS MANAGEMENT PLAN

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HAZARDOUS MATERIALS MANAGEMENT PLAN

1.0 INTRODUCTION

The Desolation Flats Project Area (DFPA) natural gas producing operators, including Marathon Oil Company, Yates Petroleum, AEC Oil & Gas (USA) Inc., EOG Resources, Inc, Tom Brown, Inc., Basin Exploration, Inc., Questar Exploration and Production Company, Merit Energy Company, and Devon SFS Operating, Inc., (hereafter referred to as "the Operators"), propose to explore and develop natural gas reserves in the Desolation Flats Area of Carbon and Sweetwater Counties, Wyoming. The Bureau of Land Management (BLM) has prepared an Environmental Impact Statement (EIS) for the proposed project, and this Hazardous Material Management Summary (HMMS), which is included as an appendix to the EIS, provides further specific information regarding the types and quantities of hazardous and extremely hazardous materials that are expected to be produced or used for the proposed project. Detailed descriptions of the proposed action and alternatives, the potential environmental consequences, and proposed mitigation and monitoring measures are provided in the EIS.

This HMMS is provided pursuant to BLM Instruction Memoranda Numbers WO-93-344 and WY-94-059, which require that all National Environmental Policy Act (NEPA) documents list and describe any hazardous and/or extremely hazardous materials that would be produced, used, stored, transported, or disposed of as a result of a proposed project. Hazardous materials, as defined herein, are those substances listed in the Environmental Protection Agency's (EPA's) *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986*, and extremely hazardous materials are those identified in the EPA's *List of Extremely Hazardous Substances* (40 Code of Federal Regulations [CFR] 355). Materials identified on either of these lists that are expected to be used or produced by the proposed project are discussed herein.

A list of hazardous and extremely hazardous materials that are expected to be produced, used, stored, transported, or disposed of as a result of the Desolation Flats Project was obtained from DFPA operators, along with Material Safety Data Sheets (MSDS) for all chemicals, compounds, and/or substances which may be used during the construction , drilling, completion, and production operations of the proposed project. The Operators have reviewed the aforementioned EPA lists, as amended, and all materials included on either of these two lists that would be used or produced by the proposed project were identified.

Some potentially hazardous materials that may be used in small, unquantifiable amounts have been excluded from this HMMS. These materials may include: wastes, as defined by the Solid Waste Disposal Act; wood products' manufactured items and articles which do not release or otherwise result in exposure to a hazardous material under normal conditions of use (i.e., steel structures, automobiles, tires, etc.); food, drugs, tobacco products, and other miscellaneous substances (i.e., WD-40, gasket sealants, glues, etc.). No unauthorized use or disposal of these materials by project personnel would occur during project implementation, and all project personnel would be directed to properly dispose of these materials in an appropriate manner. Solid wastes generated at well locations would be collected in approved waste facilities (e.g., dumpsters), and each well location would be provided with one or more such facilities during drilling and completion operations. Solid wastes would be regularly removed from well locations and transported off the DFPA to approved disposal facilities.

2.0 HAZARDOUS MATERIALS

A listing of all relevant known hazardous and extremely hazardous materials that are expected to be used, produced, stored, transported, or disposed of during project implementation is provided herein. Where possible, the quantities of these materials have been estimated on a per-well basis and their use, storage, transport, and disposal methods described.

2.1 PRODUCTION PRODUCTS

The purpose of the proposed project is to extract natural gas from the Mesaverde/Lewis and Wasatch Formations and other formations underlying the DFPA Area. Water would also be produced as a by-product of gas and oil extraction operations. Table D-1 lists and quantifies, where possible, the hazardous and extremely hazardous materials that may be found in these production products.

2.1.1 Natural Gas

Natural gas, primarily containing methane, ethane, and carbon dioxide, would be produced from approximately 250 wells at rates averaging 0.4 million cubic feet per day (mmcfd) per well. No extremely hazardous materials are anticipated to be produced with the gas stream; however, the hazardous material hexane (CAS Number 110-54-3) would be present in the gas stream at volumes ranging from approximately 4 to 24 thousand cubic feet per day (mcfd) per well (Table D-1). In addition, the gas would also likely contain small amounts of potentially hazardous polycyclic organic matter and polynuclear aromatic hydrocarbons. No other hazardous materials are known to occur within the natural gas stream.

The majority of gas produced from Desolation Flats wells would be transported from each location through newly constructed pipelines linking well locations to existing or newly constructed gas processing facilities. The natural gas would eventually be delivered to consumers for combustion. Small quantities of natural gas may be vented or flared at certain well locations during well testing operations. During testing, produced gas would be vented or flared into a flare pit pursuant to BLM/Wyoming Oil and Gas conservation Commission (WOGCC) rules and regulations (Notice to Lessees [NTL]-4A). BLM and WOGCC approval would be obtained prior to flaring or venting operations. No natural gas storage is anticipated under the proposed project.

Industry standard pipeline equipment, materials, techniques, and procedures in conformance with all applicable regulatory requirements would be employed during construction, testing, operation, and maintenance of the project to ensure pipeline safety and efficiency. All necessary authorizing actions for natural gas pipelines would be addressed prior to installation. These actions include:

- Carbon and Sweetwater County special use permits,
- BLM rights-of-way (ROWs) applications,
- conformance with U.S. Department of Transportation (DOT) pipeline regulations (49 CFR 191-192), and
- Wyoming Public Service commission Certificates to act as common carrier for natural gas.

Table D-1. Hazardous and Extremely Hazardous Materials Potentially Produced by the DFPA Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 2001.

Production Product	Hazardous Constituents[1]	Extremely Hazardous Constituents[2]	Approximate Qauntity Produced per Well[3]
Natural Gas	-- Hexane PAHs[4] POM[5]	None	0.4 mmcfd 4-24 mcfd
Condensates	-- PAHs POM	None	252 gpd
Produced Water	-- Lead Cadmium Chromium Radium 226 Uranium	None	168 gpd

1 The hazardous constituents listed are, to the best of our present knowledge, those that are or may be present in the production products and are listed under the EPA's *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986*, as amended.
2 Extremely hazardous materials are those defined in 40 CFR 355.
3 mmcfd = million cubic feet per day.
mcfd = thousand cubic feet per day.
gpd = gallons per day.
4 PAHs = polynuclear aromatic hydrocarbons.
5 POM = polycyclic organic matter.

2.1.2 Condensates

Condensates would be produced with the gas stream at most of the proposed wells. Condensates primarily consist of long chain hydrocarbon liquids (e.g., octanes), but may also contain variable quantities of the following hazardous materials: polycyclic organic matter and polynuclear aromatic hydrocarbons. No other hazardous or extremely hazardous materials are known to be present in the condensates. The volume of condensate produced from Desolation Flats wells is anticipated to be approximately 252 gallons per day (gpd) from most wells (Table D-1).

Condensates would be stored in tanks at well locations and centralized facilities, and all tanks would be fenced and bermed to contain the entire storage capacity of the largest tank plus one foot of freeboard as mandated by the BLM. Condensates would be periodically removed from storage tanks and transported by truck, in adherence to DOT rules and regulations, off the DFPA. All necessary authorizing actions for the production, storage, and transport of condensates, including the Oil Pollution Act of 1990 (storage of >1,000,000 gal) as necessary, would be addressed prior to the initiation of condensate production activities.

2.1.3 Produced Water

Produced water from Desolation Flats wells is anticipated to range in volume from 0 to 630 gpd, and would average approximately 168 gpd for most wells (Table D-1). Produced water quality from wells within the DFPA is variable and would be monitored periodically. Based on WOGCC-required water quality analyses of produced water samples from several DFPA wells, no hazardous or extremely hazardous materials are known to occur. Water from the Wasatch and Mesaverde/Lewis Mesa Verde Formations at locations in the Washakie and Great Divide Basins is known to contain the following hazardous materials: lead (CAS 7439-92-1), cadmium (CAS 7440-43-9), chromium (CAS 7440-47-3), radium 226, and uranium. However, water quality analyses of gross radiation for existing wells on the DFPA indicated only background radiation levels. No other hazardous or extremely hazardous materials are known to be present in the produced water.

Produced water would be stored in tanks at well locations and centralized facilities and would periodically be removed and transported by truck to the existing Wyoming Department of Environmental Quality (WDEQ) permitted disposal well facility. Where applicable, National Pollutant Discharge Elimination System (NPDES) permits would be obtained from the WDEQ, and produced water that meets applicable standards would be discharged to the surface at appropriate locations. All necessary authorizing actions would be met prior to the disposal of produced water including:

- BLM approval of disposal methodologies,
- RCRA compliance as necessary,
- WDEQ Water Quality Division (WDEQ-WQD) approval of wastewater disposal,
- WOGCC evaporation pond permits, and
- Wyoming State Engineer's Office (WSEO) dewatering permits (Form U.W. 5).

2.2 CONSTRUCTION, DRILLING, PRODUCTION, AND RECLAMATION

Known hazardous and extremely hazardous materials planned for use during typical construction, drilling, production, and reclamation operations for the proposed project are listed in Table D-2 and are described in detail below. Hazardous and extremely hazardous materials planned for use during project implementation fall into the following categories:

- fuels,
- lubricants,
- coolant/antifreeze and heat transfer agents,
- drilling fluids,
- fracturing fluids,
- cement and additives, and
- miscellaneous materials.

2.2.1 Fuels

Gasoline (CAS 8006-61-9), diesel fuel (CAS 68476-30-2), and natural gas are the fuels proposed for use on the project, and all contain materials classified as hazardous. Gasoline would be used to power vehicles providing transportation to and from South Baggs; diesel fuel would be used to power transport vehicles, drilling rigs, and construction equipment, and as a component of fracturing fluids (see Section 2.2.5); and natural gas would be used to power pipeline compressor stations.

Table D-2. Hazardous and Extremely Hazardous Materials Potentially Utilized During Construction, Drilling, Production, and Reclamation Operations by the Desolation Flats Natural Gas Project, Carbon and Sweetwater Counties, Wyoming.

Source	Hazardous Constituents[1]	Extremely Hazardous Constituents[2]	Approximate Quantity Used Per Well[3]
Fuel			
Gasoline	-- Benzene Toluene Ethylbenzene p-xylene m-xylene PAHs[4] POM[5] Tetraethyllead	-- Tetraethyllead	24,940 gal
Diesel Fuel	-- Benzene Toluene Ethylbenzene p-xylene m-xylene o-xylene Naphthalene PAHs POM	None	27,400 gal
Natural Gas	-- Hexane PAHs POM	None	
Lubricants	-- PAHs POM Lead Cadmium Manganese Barium Zinc Lithium	None	8 gal
Coolant/Antifreeze and Heat Transfer Agents	-- Ehylene glycol Triethylene glycol	None	180 gal 330 gal

Drilling Fluid Additives			
Caustic Soda	-- Sodium hydroxide	None	650 lbs
Lime	-- Fine mineral fibers	None	3,500 lbs
Mica	-- Fine mineral fibers	None	600 lbs
Uni-Drill	-- Acrylamide	None	50 gal
Uni-Gel	-- Fine mineral fibers	None	43,500 lbs
UNIBAR	-- Barium compounds	None	8,200 lbs
Fracturing Fluid Additives			
LGC-VI w/diesel fuel	-- Benzene Toluene Ethylbenzene p-xylene m-xylene o-xylene Naphthalene PAHs POM	None	953 gal
OPTI-FLO III	-- Glycol ether	None	144 lbs
SSO-21	-- Methanol Glycol Ether	None	15 gal
CL-29	-- Formic acid Ammonium chloride Zirconium nitrate Zirconium sulfate	None	59 gal
BA-20	-- Acetic acid	None	38 gal
	-- Fine mineral fibers	Sand	2,994 lbs
Cement and Additives	-- Fine mineral fibers PAHs POM	None	>10,000 lbs

Miscellaneous Materials	-- Methanol Corrosion inhibitors	None	3,000 gal

[1] The hazardous constituents listed are, to the best of our present knowledge, those that are or may be present in the production products and are listed under the EPA's *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986*, as amended.
[2] Extremely hazardous materials are those defined in 40 CFR 355.
[3] lb = pounds
gal = gallons.
[4] PAHs = polynuclear aromatic hydrocarbons.
[5] POM = polycyclic organic matter.

2.2.1.1 Gasoline

Gasoline would be used to power vehicles traveling to and from the DFPA. The hazardous and extremely hazardous materials likely to be found in gasoline are listed in Table D-2. The hazardous materials present in gasoline include: benzene (CAS 71-43-2), toluene (CAS 108-88-3), ethylbenzene (CAS 100-41-4), p-xylene (CAS 106-42-3), m-xylene (CAS 108-38-3), o-xylene (CAS 95-47-6), (CAS 1634-04-4), polynuclear aromatic hydrocarbons, and polycyclic organic matter. Leaded gasoline contains tetraethyllead (CAS 78-00-2), which is listed as an extremely hazardous material (Table D-2).

2.2.1.2 Diesel Fuel

Diesel fuel would be used to power transport vehicles, drilling rigs, and construction equipment. The hazardous and extremely hazardous materials likely to be found in diesel fuel are listed in Table D-2. The hazardous materials present in diesel fuel include: benzene (CAS 71-43-2), toluene (CAS 108-88-3), ethylbenzene (CAS 100-41-4), p-xylene (CAS 106-42-3), m-xylene (CAS 108-38-3), o-xylene (CAS 95-47-6), (CAS 1634-04-4), naphthalene (CAS 91-20-3), polynuclear aromatic hydrocarbons, and polycyclic organic matter.

2.2.1.3 Natural Gas

An unknown volume of natural gas would be burned to provide power for the natural gas compressor stations required for efficient pipeline function. The natural gas used to power compressor stations would be produced by the proposed project, and hazardous materials contained in this natural gas are identified in Table D-2. Further detail on the transportation of natural gas as a result of the proposed project, and relevant authorizing actions for natural gas transportation, is provided in Section 2.1.1.

2.2.2 Lubricants

Various lubricants, including: motor oils, hydraulic oils, transmission oils, compressor lube oils (8 gal/well), and greases, would be utilized for project-required vehicles, rigs, compressors, and other machinery. Some of these lubricants would likely contain polynuclear aromatic hydrocarbons and polycyclic organic matter, and some may additionally contain compounds of lead, cadmium, nickel, copper, manganese, barium, zinc, and/or lithium. No extremely hazardous materials are known to be present in the lubricants required for the proposed project.

The quantity of each lubricant used, stored, transported, and disposed of is unknown; however, all lubricants would be used, stored, transported, and disposed of following manufacturer's guidelines. Disposal of rags contaminated with lubricants would be in accordance with local, State, and federal requirements. No unauthorized disposal of lubricants (e.g., disposal of used motor oil) would occur in the project area.

2.2.3 Coolant/Antifreeze and Heat Transfer Agents

Ethylene glycol (CAS 107-21-1) and triethylene glycol (CAS 112-27-6) would be utilized as coolant/antifreeze and heat transfer agents in association with this project (Table D-2). Ethylene glycol would be used as an engine coolant/antifreeze in automobiles, construction equipment, gas dehydrators, and drilling and workover rigs. An unspecified volume of this hazardous material would be stored and transported in engine radiators. In addition, both ethylene glycol and triethylene glycol would be used as heat transfer fluids during well completion and maintenance operations. The estimated quantity of ethylene glycol required per well for completion and maintenance operations is approximately 180 gallons for the life of the project. The quantity of triethylene glycol required would range from approximately 290 to 370 gallons/well. While the total volume of ethylene glycol to be used, stored, transported, and disposed of for the proposed project is unknown, any disposal of ethylene glycol and/or triethylene glycol would be conducted in accordance with all relevant federal and state rules and regulations.

2.2.4 Drilling Fluids

Water-based muds (drilling fluids) would be used for drilling each well. Drilling fluids consist of clays and other additives that are used in standard industry procedures. Drilling fluid additives to be utilized for the proposed project include: caustic soda (650 lbs/well), cedar fibers (200 lbs/well), lime (3,500 lbs/well), mica (600 lbs/well), Uni-Drill (50 gal/well), Uni-Gel (43,500 lbs/well), UNIBAR (8,200 lbs/well), and paper (400 lbs/well) (Table D-2). All drilling operations would be conducted in compliance with applicable BLM, WOGCC, and WDEQ rules and regulations.

All known hazardous materials present in the proposed drilling fluids and additives are listed in Table D-2. These materials are: sodium hydroxide (CAS 1310-73-2), present in caustic soda; acrylamide (CAS 79-06-1), present in Uni-Drill (partially hydrolyzed polyacrylamide); barium compounds, present in UNIBAR (barium sulfate); and fine mineral fibers, present in lime, mica, and Uni-Gel (sodium montmorillonite or barite). No hazardous materials are known to occur in sawdust or paper, and no extremely hazardous materials are known to be present in any of the drilling fluids and additives.

Drilling fluid additives would be transported to well locations during drilling operations in appropriate sacks and containers in compliance with DOT regulations. Drilling fluids, cuttings, and water would be stored in reserve pits, and pits would be fenced to protect wildlife from exposure. Netting (1 inch mesh), to protect waterfowl, other birds and bats, and pit liners, to protect shallow groundwater aquifers, would be used on all reserve pits as deemed appropriate by the BLM.

When the reserve pit is no longer required, its contents would be evaporated or solidified in place, and the pit backfilled, as approved by the BLM. All reserve pit solidification procedures using flyash or other BLM-approved materials would be approved by the WOGCC and/or WDEQ prior to implementation. If the pH of pit residue is very high following solidification, off-site disposal may be required. In this event, or if other unanticipated contamination circumstances arise, reserve pit

contents would be removed and disposed of at an appropriate facility in a manner commensurate with all relevant state and federal regulations.

2.2.5 Fracturing Fluids

Hydraulic fracturing is expected to be performed at some Desolation Flats wells to augment gas flow rates. Approximately 78,700 gallons of fracturing fluids, consisting primarily of fresh water, would be required per well for the proposed project. Fracturing fluid additives and their approximate volumes include: LGV-VI with diesel fuel (953 gal/well), GEL-STA (150 lbs/well), OPTI-FLO III (144 lbs/well), CLAYFIX II (157 lbs/well), SSO-21 (15 gal/well), CL-29 (59 gal/well), BA-20 (38 gal/well), SP BREAKER (27 lbs/well), GBW-30 (9 lbs/well), BE-5 microbiocide (36 lbs/well), and sand (299,400 lbs/well) (Table D-2).

The hazardous materials present in fracturing fluid components are listed in Table D-2 and include: benzene, toluene, ethylbenzene, p-xylene, m-xylene, o-xylene, naphthalene, polynuclear aromatic hydrocarbons, and polycyclic organic matter contained in LGC-VI with diesel fuel (hydrocarbon gel concentrate);glycol ether present in OPTI-FLO III and SSO-21; methanol (CAS 67-56-1) present in SSO-21; formic acid (CAS 64-18-6), ammonium chloride (CAS 12125-02-9), zirconium nitrate (CAS 13746-89-9), and zirconium sulfate (CAS 14644-61-2) present in CL-29; acetic acid (CAS 64-19-7) present in BA-20; and fine mineral fibers present in sand. No hazardous materials are known to be present in GEL-STA (sodium salt), CLAYFIX II (alkylated quaternary chloride), SP BREAKER (sodium persulfate), GBW-30 (cellulase enzyme carbohydrate), and BE-5 (5-chloro-2-methyl-4-isothiazolin-3-one, 2-methyl-4-isothiazolin-3-one, a microbiocide). No extremely hazardous materials are known to be present in any of the fracturing fluid additives.

Fracturing fluids and additives would be transported to well locations in bulk (e.g., LGC-VI with diesel fuel, sand) or in appropriately designed and labeled containers (e.g., OPTI-FLO III in 50 lb fiber drums; SSO-21, CL-29, and BA-20 in 55 gal drums). All transportation of fracturing fluids and additives would be in adherence with DOT rules and regulations.

During fracturing, fluids are pumped under pressure down the well bore and out through perforations in the casing into the formation. The pressurized fluid enters the formation and induces hydraulic fractures. When the pressure is released at the surface, a portion of the fracturing fluids would be forced to the well bore and up into a tank. The fracturing fluids would then be transferred to lined reserve pits and evaporated, or hauled away from the location and reused or disposed of at an authorized facility. Decisions regarding the appropriate disposal of fracturing fluids would be made by the BLM on a case-by-case basis.

2.2.6 Cement and Additives

Well completion and abandonment operations would entail cementing and plugging various segments of the well bore to protect freshwater aquifers and other down-hole resources. Materials potentially used for cementing operations include: cement, calcium hydroxide, calcium chloride, pozzlans, sodium bicarbonate, potassium chloride, and insulating oil. An unknown quantity of cement and additives, which may contain the hazardous material classes of fine mineral fibers, polycyclic organic matter, and polynuclear aromatic hydrocarbons, would be transported in bulk to each well site by a qualified cement supply company. Small quantities may be transported and stored on-site in 50 pound sacks. Wells would be cased and cemented as directed and approved by the BLM (for federal minerals) and WOGCC (for state and patented minerals). No extremely

hazardous materials are known to be present in the cement and additives proposed for use in this project.

2.2.7 Miscellaneous Materials

Miscellaneous materials, potentially containing hazardous and/or extremely hazardous materials, that may be used for the proposed project include: methanol and corrosion inhibitors. The material would be transported to the site by qualified service and supply companies and would be used and disposed of following manufacturer's guidelines.

An unknown quantity of methanol would be used to de-ice well bores and as a hydrate deterrent during completion and natural gas transport operations. Methanol is a listed hazardous chemical and would be stored, transported, used, and disposed of in adherence with all applicable federal and state rules, regulations, and guidelines.

2.3 COMBUSTION EMISSIONS

Combustion emissions from gasoline and diesel engines, as well as flaring natural gas, will occur as a result of this project. The complete oxidation of hydrocarbon fuels yields only carbon dioxide and water as combustion products; however, complete combustion is seldom achieved. Unburned hydrocarbons, particulate matter (e.g., carbon, metallic ash), carbon monoxide, nitrogen oxides, and possibly sulfur oxides would be expected as direct exhaust contaminants. Secondary contaminants would likely include the formation of ozone from the photolysis of nitrogen oxides. A listing of the hazardous and extremely hazardous materials potentially present in combustion emissions is provided in Table D-3.

Unburned hydrocarbons may contain potentially hazardous polynuclear aromatic hydrocarbons, and particulate matter may contain metal-based particulates from lead anti-knock compounds in the fuel, metallic lubricating oil additives, and engine wear particulates (Table D-3). Hazardous materials in the particulate matter may therefore include compounds of lead, cadmium, nickel, copper, manganese, barium, zinc, and /or lithium.

Nitrogen dioxide (CAS 10102-44-0), sulfur dioxide (CAS 7446-09-5), sulfur trioxide (CAS 7446-11-9), and ozone (CAS 10028-15-6) are probable combustion emissions, all classified as extremely hazardous materials. These materials would be either directly released in minor quantities from internal combustion engines, or would be formed through photolysis (i.e. ozone). No releases of these or other materials would occur in excess of those allowed for Prevention of Significant

Deterioration Class II areas, WDEQ-Air Quality Division Implementation Plan; nor would releases occur that jeopardize National Ambient Air Quality Standards for Desolation Flats. Particulate matter emissions and larger unburned hydrocarbons would eventually settle out on the ground surface, whereas gaseous emissions would react with other air constituents as components of the nitrogen, sulfur, and carbon cycles.

Table D-3. Hazardous and Extremely Hazardous Materials Potentially Present in Combustion Emissions of the Desolation Flats Natural Gas Project, Carbon and Sweetwater Counties, Wyoming, 2001.

Emission	Hazardous Constituents[1]	Extremely Hazardous Constituents[2]
Hydrocarbons	-- PAHs[3]	None
Particulate Matter	-- Lead Cadmium Nickel Copper Manganese Barium Zinc Lithium	None
Gases	-- Nitrogen dioxide Sulfur dioxide Sulfur trioxide Ozone	-- Nitrogen dioxide Sulfur dioxide Sulfur trioxide Ozone

1 The hazardous constituents listed are, to the best of our present knowledge, those that are or may be present in the production products and are listed under the EPA's *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986*, as amended.
2 Extremely hazardous materials are those defined in 40 CFR 355.
3 PAHs = plynuclear aromatic hydrocarbons.

3.0 MANAGEMENT POLICY AND PROCEDURE

DFPA Operators and their contractors would ensure that all production, use, storage, transport, and disposal of hazardous and extremely hazardous materials as a result of the proposed project would be in strict accordance with all applicable existing, or hereafter promulgated federal, state, and local government rules, regulations, and guidelines. All project-related activities involving the production, use, and/or disposal of hazardous or extremely hazardous materials would be conducted in such a manner as to minimize potential environmental impacts.

DFPA Operators would comply with emergency reporting requirements for releases of hazardous materials. Any release of hazardous or extremely hazardous substances in excess of the reportable quantity, as established in 40 CFR 117, would be reported as required by the *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980*, as amended. The materials for which such notification must be given are the extremely hazardous substances listed under the *Emergency Planning and Community Right to Know* Section 302 and the hazardous substances designated under Section 102 of CERCLA, as amended. If a reportable quantity of a hazardous or extremely hazardous substance is released, prompt notice of the release would be given to the BLM's Authorized Officer and all other appropriate federal and state

agencies. Additionally, notice of any spill or leakage (i.e. undesirable event), as defined in BLM NTL-3A, would be given by DFPA Operators to the Authorized Officer and other such federal and state officials as required by law.

DFPA Operators have evaluated field operations in the DFPA and have or would prepare and implement multiple plans and/or policies to ensure environmental protection from hazardous and extremely hazardous materials. These plans/policies shall be available for review at the BLM Rawlins and Rock Springs field offices. These plans/policies include, where applicable:

- spill prevention and control countermeasure plans;
- oil/condensate spill response plans;
- inventories of hazardous chemical categories pursuant to Section 312 of the SARA, as amended; and
- emergency response plans.

Development operations in Desolation Flats would be in compliance with regulations promulgated under the Resource Conservation and Recovery Act (RCRA), Federal Water Pollution Control Act (Clean Water Act), Safe Drinking Water Act (SWDA), Toxic Substances Control Act (TSCA), Occupational Safety and Health Act (OSHA), and the Federal Clean Air Act (CAA). In addition, project operations would also comply with all attendant state rules and regulations relating to hazardous material reporting, transportation, management, and disposal.

Table D-4 (below) provides a generic list of hazardous chemical categories for the oil and gas exploration and production industry.

Table D-4. Generic List of Hazardous Chemical Categories for the Oil and Gas Exploration and Production Industry.

Hazardous Chemical Category (With Examples of Representative Chemicals)	Physical and Health Hazards
Acetylene Gas (CAS#74-86-2)	Fire, sudden release of pressure
Acids Hydrochloric acid (<30%)(CAS#7647-01-0) Hydrofluoric acid (<12%)(CAS#7664-39-3) Sulfuric acid (CAS#7664-93-9)	Immediate (Acute)
Alkalinity and pH Control Materials Calcium hydroxide (CAS#1305-62-0) Potassium hydroxide (CAS#1310-58-3) Soda ash (CAS#497-19-8) Sodium bicarbonate (CAS#144-55-8) Sodium carbonate (CAS#497-19-8) Sodium hydroxide (CAS#1310-73-2)	Immediate (Acute)
Biocides Amines Glutaraldehyde (CAS#111-30-8) Isopropanol (CAS#67-63-0) Thiozolin	Immediate (Acute), Fire

Hazardous Chemical Category (With Examples of Representative Chemicals)	Physical and Health Hazards
Breakers Ammonium persulfate (CAS#7727-54-0) Benzoic acid (CAS#65-85-0) Enzyme Sodium acetate (CAS#127-09-3) Sodium persulfate (CAS#7772-27-1)	Immediate (Acute), Fire
Buffers Sodium acetate (CAS#127-09-3) Sodium bicarbonate (CAS#144-55-8) Sodium carbonate (CAS#497-119-8) Sodium deacetate	Immediate (Acute)
Calcium Compounds Calcium bromide (CAS#71626-99-8) Calcium hypochlorite (CAS#7778-54-3) Calcium oxide (CAS#1305-78-8) Gypsum (CAS#10101-41-4) Lime (CAS#1305-78-8)	Immediate (Acute)
Cement (CAS#65997-15-1)	Immediate (Acute)
Cement Additives - Accelerators Calcium chloride (CAS#10035-04-8) Gypsum (CAS#10101-41-4) Potassium chloride Sodium chloride (CAS#7647-14-5) Sodium metasilicate	Immediate (Acute)
Cement Additives - Fluid Loss Cellulose polymer Latex	Immediate (Acute)
Cement Additives - Miscellaneous Cellulose flakes (CAS#9004-34-6) Coated aluminum Gilsonite (CAS#12002-43-6) Lime (CAS#1305-78-8) Long chain alcohols	Immediate (Acute)
Cement Additives - Retarders Cellulose polymer Lignosulfonates	Immediate (Acute)
Cement Additves - Weight Modification Barite (CAS#7727-43-7) Bentonite Diatomaceous earth (CAS#68855-54-9) Fly ash Glass beads Hematite (CAS#1317-60-8) Ilmenite Pozzolans	Immediate (Acute)
Chloride Salts Calcium chloride Potassium chloride Sodium chloride (CAS#7647-14-5) Zinc chloride (CAS#7646-85-7)	Immediate (Acute)

Hazardous Chemical Category (With Examples of Representative Chemicals)	Physical and Health Hazards
Chlorine Gas (CAS#7782-50-5)	Immediate (Acute), Sudden release of pressure
Corrosion Inhibitors 4-4' Methylene dianiline (CAS#101-77-9) Acetylenic alcohols Amine formulations Ammonium bisulfite (CAS#10192-30-0) Basic zinc carbonate (CAS#3486-35-9) Gelatin Ironite sponge (CAS#1309-37-1) Sodium chromate (CAS#7775-11-3) Sodium dichromate (CAS#10588-01-9) Sodium polyacrylate Zinc lignosulfonate Zinc oxide (CAS#1314-13-2)	Immediate (Acute), Delayed (chronic), Fire
Crosslinkers Boron compounds Organo-metallic complexes	Immediate (Acute), Fire
Defoaming Agents Aluminum stearate Fatty acid salt formation Mixed alcohols Silicones	Immediate (Acute)
Deflocculants Acrylic polymer Calcium lignosulfonate Chrome-free lignosulfonate Chromium lignosulfonate Iron lignosulfonate Quebracho Sodium acid pyrophosphate (SAPP) Sodium hexametaphosphate (CAS#10124-56-8) Sodium phosphate (oilfos) Sodium tetraphosphate Stryene, maleaic anhydride co-polymer salt Sulfo-methylated tannin	Immediate (Acute)
Detergents/Foamers Amphoteric surfactant formulation Ethoxylated phenol Detergents	Immediate (Acute), Fire
Explosives Charged well jet perforating gun, Class C explosives Detonators, Class A explosives Explosive power device, Class B	Sudden release of pressure

Hazardous Chemical Category (With Examples of Representative Chemicals)	Physical and Health Hazards
Filtration Control Agents Acrylamide AMPS copolymer Aniline formaldehyde copolymer hydrochlorite Causticized leonardite Sulfomethylated phenol formaldehyde Leonardite Partially hydrolyzed polyacrylamide Polyalkanolamine ester Polyamine acrylate Polyanionic cellulose Potassium lignite Preserved starch Sodium carboxymethyl cellulose (CAS#9004-32-4) Starch (CAS#9005-25-8) Vinylsulfonate copolymer	Immediate (Acute)
Flocculants Anionic polyacrylamide	Immediate (Acute)
Fluoride Generating Compounds Ammonium bifluoride (CAS#1341-49-7) Ammonium fluoride (CAS#12125-0108)	Immediate (Acute)
Friction Reducers Acrylamide methacrylate copolymers Sulfonates	Immediate (Acute)
Fuels Diesel (CAS#68476-34-6) Fuel oil Gasoline (CAS#8006-61-9)	Immediate (Acute), Delayed (Chronic), Fire
Gelling Agents Cellulose and guar derivatives	Immediate (Acute)
Gel Stabilizers Sulfites Thiosulfates	Immediate (Acute)
Hydrogen Sulfide (CAS#7783-06-4)	Immediate (Acute), Fire
Inert Gases Carbon dioxide (CAS#124-38-9) Nitrogen (CAS#7727-37-9)	Immediate (Acute), Sudden release of pressure
Lost Circulation Materials Cane fibers Cedar fibers Cellophane fibers Corn cob Cottonseed hulls Mica (CAS#12001-26-2) Nut shells Paper Rock wool Sawdust	Immediate (Acute)

Hazardous Chemical Category (With Examples of Representative Chemicals)	Physical and Health Hazards
Lubricants, Drilling Mud Additives Graphite (CAS#7782-42-5) Mineral oil formulations Organo-fatty acid salts Vegetable oil formulations Walnut shells	Immediate (Acute)
Lubricants, Engine Motor oil Grease	Immediate (Acute)
Miscellaneous Drilling Additives Diatomaceous earth (CAS#68855-54-9) Oxalic acid (CAS#144-62-7) Potassium acetate (CAS#127-08-2) Zinc bromide (CAS#7699-45-8)	Immediate (Acute), Delayed (Chronic)
Odorants Mercaptans, aliphatic	Immediate (Acute)
Oil Based Mud Additives Amide polymer formulations Amine treated lignite Asphalt Diesel (CAS#68476-34-6) Gilsonite (CAS#12002-43-6) Mineral oil Organophilic clay Organophilic hectorite Petroleum distillate (CAS#8030-30-6) Polymerized organic acides Sulfonate surfactant	Immediate (Acute), Delayed (Chronic), Fire
Organic Acids Acetic acid (CAS#64-19-7) Acetic anhydride (CAS#108-24-7) Benzoic acid (CAS#65-85-0) Citric acid (CAS#5949-29-1) Formic acid (CAS#64-18-6) Organic acid salts	Immediate (Acute), Fire
Preservatives Dithiocarbamates Paraformaldehyde (CAS#30525-89-4) Isothiazions	Immediate (Acute)
Produced Hydrocarbons Condensate Crude oil (CAS#8002-05-9) Natural Gas	Immediate (Acute), Delayed (Chronic), Fire, Sudden release of pressure
Proppants Bauxite (CAS#1318-16-7) Resin coated sand Zirconium proppant	Immediate (Acute)
Radioactive, Special Form Cesium 137 (encapsulated) logging tool	Delayed (Chronic)

Hazardous Chemical Category (With Examples of Representative Chemicals)	Physical and Health Hazards
Resin and Resin Solutions Melamine resins Phenolic resins Polyglycol resins	Immediate (Acute), Fire
Salt Solutions Aluminum chloride (CAS#7446-70-0) Ammonium chloride (CAS#12125-02-9) Calcium bromide (CAS#17626-99-8) Calcium chloride (CAS#10035-04-8) Calcium sulfate (CAS#778-18-9) Ferrous sulfate (CAS#7782-63-0) Potassium chloride(CAS#7447-40-7) Sodium chloride (CAS#7647-14-5) Sodium sulfate (CAS#7757-82-6) Zinc bromide (CAS#7699-45-8) Zinc chloride (CAS#7646-85-7) Zinc sulfate	Immediate (Acute)
Scale Inhibitors Ethylenediaminetetraacetic acid (EDTA) (CAS#60-00-4) Inorganic phosphates Isopropanol (CAS#67-63-0) Nitrilotriacetic acid (NTA) (CAS#139-13-9) Organic phosphates Polyacrylate Polyphosphates	Immediate (Acute), Fire
Shale Control Additives Hydrolyzed polyacrylamide polymer Organo-aluminum complex Polyacrylate polymer Sulfonated asphaltic residuum	Immediate (Acute)
Silica	Immediate (Acute), Delayed (Chronic)
Solvents 1,1,1-Trichloroethane (CAS#71-55-6) Acetone (CAS#67-64-1) Aliphatic hydrocarbons Aromatic naphtha (CAS#8032-32-4) Carbon tetrachloride (CAS#56-23-5) Diacetone alcohol Ethylene glycol monobutyl ether (CAS#111-76-2) Kerosene (CAS#8008-20-6) Isopropanol (CAS#67-63-0) Methyl ethyl ketone (MEK) (CAS#78-93-3) Methyl isobutyl ketone (MIBK) (CAS#108-10-1) Methanol (CAS#67-56-1) t-Butyl alcolhol (CAS#75-65-0) Toluene (CAS#108-88-3) Turpentine (CAS#8006-64-2) Xylene (CAS#1330-20-7)	Immediate (Acute), Delayed (Chronic), Fire

Hazardous Chemical Category (With Examples of Representative Chemicals)	Physical and Health Hazards
Spotting Fluids Nonoil base spotting fluid Oil base spotting fluid (diesel oil base) Oil base spotting fluid (mineral oil base) Sulfonated vegetable ester	Immediate (Acute), Fire
Surfactants - Corrosive Alcohol ether sulfates Amines Quarternary polyamine Sulfonic acids	Immediate (Acute)
Surfactants - Flamable Amines Ammonium salts Fatty alcohols Isopropanol (CAS#67-56-1) Oxylalkylated phenols Petroleum naphtha (CAS#8030-30-6) Sulfonates	Immediate (Acute), Fire
Surfactants - Miscellaneous Amine salts Glycols Phophonates	Immediate (Acute)
Temporary Blocking Agents Benzoic acid (CAS#65-85-0) Naphthalene (CAS#91-20-3) Petroleum wax polymers Sodium chloride (CAS#7647-14-5)	Immediate (Acute)
Viscosifiers Attapulgite Bentonite Guar gum (CAS#9000-30-0) Sepiolite Xantham gum	Immediate (Acute)
Weight Materials Barite (CAS#7727-43-7) Calcium carbonate (CAS#1317-65-3) Galena Hematite (CAS#1317-60-8) Siderite	Immediate (Acute)

APPENDIX E

VEGETATION:

Classification of Surface Drainages and Reservoirs/Springs
According to NWI Maps

WYNDD Correspondence Regarding Sensitive Plant Species

APPENDIX E

VEGETATION

Table E-1. Classification of Small, Non-Linear Wetland Areas Identified on NWI Maps within the Project Area.			
Legal Description	Classification	No. Of Sites	Reservoir Name
Powder Mt. Quad			
S6 T13N R96W	PUSC	2	Unnamed
S4 T13N R96W	PUSC	1	Unnamed
S7 T13N R96W	PUSC	1	Unnamed
S8 T13N R96W	PUSC	1	Unnamed
S9 T13N R96W	PUSC	2	Unnamed
S18 T13N R96W	PUSC	6	Unnamed
S17 T13N R96W	PUSC	1	Unnamed
S16 T13N R96W	PUSC	1	Unnamed
S15 T13N R96W	PUSC	3	Unnamed
S15 T13N R96W	PUSCh	1	Unnamed
S33 T13N R96W	PUSAh	1	North Reservoir
S36 T13N R96W	PUSAh	1	Unnamed
S31 T13N R95W	PUSAh	1	Unnamed
S6 T13N R96W	PUBFx	2	Unnamed
S18 T13N R95W	PABFh	1	Grindstone Spring
S15 T13N R96W	PABF	1	Flowing Well
S20 T13N R96W	PABFh	1	Carson Reservoir
Rotten Springs Quad			
S5 T13N R94W	PABFh	1	Unnamed
S8 T13N R95W	PUBFx	1	Unnamed
S12 T13N R95W	PABFh	1	Unnamed
S14 T13N R95W	PABFh	1	Unnamed

S14 T13N R95W	PEMC	1	Unnamed
S22 T13N R95W	PUSAh	1	Unnamed
S24 T13N R95W	PABFh	1	Unnamed
S28 T13N R95W	PUSCh	1	Chimney Reservoir
S28 T13N R95W	PEMC	1	Unnamed
S29 T13N R94W	PABFh	1	Spring Draw Reservoir
S35 T13N R95W	PUSAx	1	Drill Hole
S31 T13N R94W	PABFh	1	Cherokee Reservoir
S32 T13N R94W	PUSCh	1	Flat Draw Reservoir
McPherson Springs Quad			
S3 T13N R94W	PEMA	1	Unnamed
S12 T13N R94W	PABFh	2	Unnamed by Flowing Well
S12 T13N R94W	PEMA	4	Unnamed
S16 T13N R94W	PEMAh	1	Unnamed
S23 T13N R94W	PABFh	1	Unnamed by McPherson Springs
S26 T13N R94W	PUBFx	1	Unnamed
S25 T13N R94W	PSSA	1	Unnamed
S24 T13N R94W	PUSC	1	Unnamed
Prehistoric Rim Quad			
S31 T15N R95W	PUSC	1	Unnamed
S35 T15N R96W	PUSC	3	Unnamed
S2 T14N R96W	PEMA	1	Unnamed
S2 T14N R96W	PUSC	2	Unnamed
S1 T14N R96W	PUSC	4	Unnamed
S11 T14N R96W	PUSC	1	Unnamed
S12 T14N R96W	PUSC	3	Unnamed
S7 T14N R95W	PUSC	1	Unnamed

S15 T14N R96W	PUSC	1	Unnamed
S14 T14N R96W	PUSC	3	Unnamed (one of these is partially on S13)
S13 T14N R96W	PUSC	2	Unnamed
S18 T14N R95W	PUSC	1	Unnamed
S22 T14N R96W	PUSC	2	Unnamed
S22 T14N R96W	PUSA	2	Unnamed
S22 T14N R96W	PUSC	7	Unnamed
S26 T14N R96W	PUSC	2	Unnamed
S30 T14N R95W	PUSC	3	Unnamed
S30 T14N R95W	PUSA	1	Unnamed
S32 T14N R96W	PUSC	2	Unnamed
S33 T14N R96W	PUSC	2	Unnamed
S35 T14N R96W	PUSC	1	Unnamed
S36 T14N R96W	PABFh	1	Unnamed
S31 T14N R95W	PABFh	1	Unnamed
S4 T14N R96W	PUSC	1	Unnamed
Powder Mt. NE Quad			
S27 T15N R95W	PUSC	1	Unnamed
S30 T15N R94W	PABFh	1	Unnamed
S12 T15N R95W	PUSC	1	Unnamed
S20 T14N R95W	PUSC	1	Sand Creek Lake
S20 T14N R95W	PUSC	3	Unnamed
S29/S28 T14N R95W	PUSC	1	Unnamed
S27 T14N R95W	PUBFh	1	Unnamed
S33 T14N R95W	PUSCx	1	Unnamed
S31 T14N R94W	PUSC	1	Unnamed
S5 T13N R95W	PUSCx	1	Unnamed

S5 T13N R95W	PUBFx	1	Unnamed
S4 T13N R95W	PABFh	1	Sandy Butte Reservoir
Dripping Rock Quad			
S27 T15N R94W	PABFh	1	Unnamed
S27 T15N R94W	PUSAh	1	Unnamed
S29/S28 T15N R93W	PUSCh	1	Unnamed (On section line)
S32 T15N R94W	PABFh	1	Unnamed
S34 T15N R94W	PABFh	1	Continental Reservoir No. 2
S35 T15N R94W	PUSAh	1	Unnamed
S36 T15N R94W	PUSCh	1	Unnamed
S36 T15N R94W	PUSAh	1	Unnamed
S31 T15N R93W	PUSAh	1	Unnamed
S32 T15N R93W	PUSCh	1	Snow Bank Reservoir
S4 T14N R94W	PABFh	1	Continental Reservoir No. 1
S4 T14N R94W	PUSCh	1	Unnamed
S4 T14N R94W	PUSAh	1	Unnamed
S5 T14N R93W	PEMAh	1	Unnamed
S10 T14N R94W	PABFh	1	Horse Trap Reservoir
S7 T14N R93W	PUSCh	1	Dripping Rock Reservoir
S8 T14N R93W	No Designation	1	Dripping Rock Spring
S7 T14N R93W	PABFh	1	Dripping Rock Pit #2
S16 T14N R94W	PABFh	1	Unnamed
S13 T14N R94W	PUSCh	1	Brush Reservoir
S13 T14N R94W	PUSCh	1	Row Reservoir
S17 T14N R93W	PABFh	1	Unnamed
S19 T14N R93W	PUSAh/PABFh	1	Big Ridge Reservoir
S26 T14N R94W	PUSCh	1	Unnamed

S28 T14N R93W	PUSAh	1	Unnamed
Flat Top Mt. Quad			
S33 T15N R93W	PUSAh	1	Unnamed
S3 T14N R93W	PUSAh	1	Unnamed
S10 T14N R93W	PEMAh	1	Unnamed
S15 T14N R93W	PUSCh	1	Unnamed
Barrel Spring Quad			
S34 T16N R96W	PUSCh	1	N-T Reservoir
S36 T16N R96W	PUSC	1	Unnamed
S31 T16N R95W	PABFh	1	Unnamed
Salazar Butte Quad			
S22 T16N R95W	PUSC	1	Unnamed
S19 T16N R94W	PUSAh	1	Unnamed
S27 T16N R95W	PUSCh	1	Unnamed
S25 T16N R95W	PUSCh	1	Unnamed
S32 T16N R95W	PUSC	1	Unnamed
S5 T15N R95W	PUSC	3	Unnamed
S16 15N R95W	PUSCh	1	Unnamed
S16 15N R95W	PUSC	1	Unnamed
S15 T15N R95W	PABFh	1	Salazar Reservoir
S22 T15N R95W	PUSC	1	Unnamed
South Barrel Springs Quad			
S28 T16N R94W	PUSCh	1	Unnamed
S27 T16N R94W	PABFh	1	Unnamed
S4 T15N R94W	PUSCh	1	Unnamed
S4 T15N R94W	PABFh	1	Unnamed (on riser)
S13 T15N R94W	PABFh	1	Dad Dail Reservoir

S13 T15N R94W	PEMC	1	Unnamed
S18 T15N R93W	PUSCh	1	Unnamed
S23 T15N R94W	PUSAh	1	Unnamed
S20 T15N R93W	PUSAh	1	Unnamed
S20 T15N R93W	PABFh	1	Unnamed
Mexican Flats Quad			
S33 T16N R93W/ S4 T15N R93W	PUSC	1	Unnamed (on line)
S16 T15N R93W	PEMC	1	Unnamed
S16 T15N R93W	PABFh	1	Unnamed
S21 T15N R93W	PEMCh	1	Unnamed
S21 T15N R93W	PEMC	2	Unnamed
S21 T15N R93W	PABFh	1	Unnamed

Table E-2. Classification of Linear Wetland Areas Identified on NWI Maps within the Project Area.

DRAINAGE NAME	PRIMARY TRIBUTARY TO:	SECONDARY TRIBUTARY TO:	CLASSIFICATION
Sand Creek	Little Snake River		R4SBA with scattered
Unnamed Tributaries	Sand Creek	Little Snake River	R4SBA
Reader Cabin Draw	Sand Creek	Little Snake River	R4SBA
Unnamed Tributaries	Reader Cabin Draw	Sand Creek	R4SBA
Grindstone Wash	Sand Creek	Little Snake River	R4SBA with spots of R4SBC
Haystack Wash	West Haystack Wash (outside	Sand Creek	R4SBA with many
East Haystack Wash	West Haystack Wash(outside	Sand Creek	R4SBA
Willow Creek	Sand Creek	Little Snake River	R4SBA with limited spots
West Branch of Willow Creek	Willow Creek	Sand Creek	R4ABA
Shallow Creek	West Branch of Willow Creek	Willow Creek	R4SBA
Tributary of Shallow Creek	Shallow Creek	West Branch of Willow Creek	R4SBA
Tributaries of West	West Branch of Willow Creek	Willow Creek	R4SBA
East Branch of Willow Creek	Willow Creek	Sand Creek	R4SBA with scattered R4SBC
Tributaries of East	East Branch of Willow Creek	Willow Creek	R4SBA
North Prong of Red Creek	Sand Creek	Little Snake River	R4SBA

Tributary of North Prong	North Prong of Red Creek	Sand Creek	R4SBA
Hangout Wash	Sand Creek	Little Snake River	R4SBA
Tributaries of Hangout Wash	Hangout Wash	Sand Creek	R4SBA
Hartt Cabin Draw	Sand Creek	Little Snake River	R4SBA
Tributaries of Hartt Cabin Draw	Hartt Cabin Draw	Sand Creek	R4SBA
Cedar Breaks Draw	Sand Creek	Little Snake River	R4SBA
Tributaries of Cedar Breaks Draw	Cedar Breaks Draw	Sand Creek	R4SBA
Colloid Draw	Sand Creek	Little Snake River	R4SBA
Windmill Draw	Windmill Draw Wash (outside	Red Wash (outside	R4SBA
Tributaries of Windmill	Windmill Draw	Windmill Draw Wash	R4SBA
South Barrel Springs	Windmill Draw Wash (outside	Red Wash (outside	R4SBA
Tributaries to South	South Barrel Springs Draw	Windmill Draw Wash	R4SBA
East Fork Cherokee Creek	Unnamed	Little Snake River	R4SBA

APPENDIX E: VEGETATION

Desolation Flats Wetlands Legend

R4SBC = Riverine, Intermittent, Streambed, Seasonally Flooded.

R4SBA = Riverine, Intermittent, Streambed, Temporarily Flooded

PABFh = Palustrine, Aquatic Bed, Semipermanently Flooded, Diked/Impounded

PUSAh = Palustrine, Unconsolidated Shore, Temporarily Flooded, Diked/Impounded

PUSA = Palustrine, Unconsolidated Shore, Temporarily Flooded

PUSAx = Palustrine, Unconsolidated Shore, Temporarily Flooded, Excavated

PEMAh = Palustrine, Emergent, Temporarily Flooded, Diked/Impounded

PEMA = Palustrine, Emergent, Temporarily Flooded

PEMCh = Palustrine, Emergent, Seasonally Flooded, Diked/Impounded

PEMC = Palustrine, Emergent, Seasonally Flooded

PUSCh = Palustrine, Unconsolidated Shore, Seasonally Flooded, Diked/Impounded

PUSC = Palustrine, Unconsolidated Shore, Seasonally Flooded

PUBF = Palustrine, Unconsolidated Bottom, Semipermanently Flooded

PUBFh = Palustrine, Unconsolidated Bottom, Semipermanently Flooded, Diked/Impounded

PUBFx = Palustrine, Unconsolidated Bottom, Semipermanently Flooded, Excavated

PSSA = Palustrine, Scrub-Shrub, Temporarily Flooded

Wyoming Natural Diversity Database

15 February 2002

Plant Species of Concern
In T13-16N and R93-96W and one township buffer
For Melody Smith, BKS Environmental.

Citations for Tracked Species

*****PENSTEMON GIBBENSII**
EOCODE: PDSCR1L6U0*001*WY

Fertig, W. and M.L. Neighbours. 1996. Status report on PENSTEMON GIBBENSII in south-central Wyoming. Unpublished report prepared for the Bureau of Land Management Wyoming State Office and Rawlins District by the Wyoming Natural Diversity Database, 31 January 1996. XX pp. (U96FER01WYUS)

Fertig, Walter. Botanist. Wyoming Natural Diversity Database, University of Wyoming, PO Box 3381, Laramie, Wyoming 82071. (307) 766-3020. (PNDFER01WYUS)

Neighbours, M. L. Data manager, Wyoming Natural Diversity Database, 1604 Grand Ave., Suite #2, Laramie, WY 82070. (307) 745-5026. (PNDNEI01WYUS)

Dorn, R.D. 1989. Report on the status of Penstemon gibbensii, a candidate Threatened species. Unpublished report prepared for the US Fish and Wildlife Service by Mountain West Environmental Services, Cheyenne, Wyoming. (U89DOR09WYUS)

Marriott, Hollis J. Former Heritage Botanist, WYNDD, and former Public Lands Coordinator, The Nature Conservancy. 655 N. Cedar, Laramie, WY 82070. (307) 721-4909. (PNDMAR01WYUS)

United States Department of the Interior, Bureau of Land Management. 1988. Proposed resource management plan and final environmental impact statement for the Great Divide Resource Area, Rawlins District, WY. (N88UNI01WYUS)

Dorn, Robert D. Botanical Consultant, Mountain West Environmental Services, Box 1471, Cheyenne, WY 82003. (307) 634-6328. (PNDDOR01WYUS)

Warren, A. 1992. Monitoring/evaluation report on PENSTEMON GIBBENSII. Bureau of Land Management Great Divide Resource Area Memorandum, dated 16 January 1992. (F92WAR01WYUS)

Dorn, R.D. 1982. A new species of PENSTEMON (Scrophulariaceae) from Wyoming. Brittonia 34 (3): 334-335. (A82DOR01WYUS)

Marriott, H. and Dueholm, K. 1987. Field forms for Penstemon gibbensii/Cherokee Basin visit of June 16, 1987 by Wyoming Natural Diversity Database. Special plant survey form and site survey form. (F87MAR01WYUS)

***CHRYSOTHAMNUS GREENEI
EOCODE: PDAST2C030*001*WY

Dorn, Robert D. Botanical Consultant, Mountain West Environmental Services, Box 1471, Cheyenne, WY 82003. (307) 634-6328. (PNDDOR01WYUS)

***DESCURAINIA PINNATA SSP PAYSONII
EOCODE: PDBRA0X03K*006*WY

Ward, B., B.E. Nelson, and R.L. Hartman. 1998. Final report on the general floristic inventory of south-central Wyoming. Report prepared for the Bureau of Land Management Rawlins and Rock Springs districts by the Rocky Mountain Herbarium, University of Wyoming. 18 pp. + app. (U98WAR01WYUS)

***ASTRAGALUS NELSONIANUS
EOCODE: PDFAB0F5V0*007*WY

Ward, B., B.E. Nelson, and R.L. Hartman. 1998. Final report on the general floristic inventory of south-central Wyoming. Report prepared for the Bureau of Land Management Rawlins and Rock Springs districts by the Rocky Mountain Herbarium, University of Wyoming. 18 pp. + app. (U98WAR01WYUS)

Nelson, B.E. (Ernie), Manager, Rocky Mountain Herbarium, Dept. of Botany, P.O. Box 3165, University of Wyoming, Laramie, Wy 82071. (307) 766-2236 (PNDNEL01WYUS)

***ERIGERON COMPACTUS VAR. CONSIMILIS
EOCODE: PDAST3M550*002*WY

Lichvar, Robert W. [Former botanist with the Wyoming Heritage Program, Wyoming Department of Environmental Quality in Cheyenne]. (PNDLIC01WYUS)

Ward, B., B.E. Nelson, and R.L. Hartman. 1998. Final report on the general floristic inventory of south-central Wyoming. Report prepared for the Bureau of Land Management Rawlins and Rock Springs districts by the Rocky Mountain Herbarium, University of Wyoming. 18 pp. + app. (U98WAR01WYUS)

Dorn, Robert D. Botanical Consultant, Mountain West Environmental Services, Box 1471, Cheyenne, WY 82003. (307) 634-6328. (PNDDOR01WYUS)

***ANDROSTEPHIUM BREVIFLORUM
EOCODE: PMLIL06010*004*WY

Warren, Andy. (PNDWAR01WYUS)

***SENECIO SPARTIOIDES VAR MULTICAPITATUS
EOCODE: PDAST8H250*002*WY

Dorn, Robert D. Botanical Consultant, Mountain West Environmental Services, Box 1471, Cheyenne, WY 82003. (307) 634-6328. (PNDDOR01WYUS)

*****PHACELIA GLANDULOSA VAR DESERTA**
EOCODE: PDHYD0C1S1*003*WY

Ward, B., B.E. Nelson, and R.L. Hartman. 1998. Final report on the general floristic inventory of south-central Wyoming. Report prepared for the Bureau of Land Management Rawlins and Rock Springs districts by the Rocky Mountain Herbarium, University of Wyoming. 18 pp. + app. (U98WAR01WYUS)

Fertig, W. 1999. Status report on desert glandular phacelia (PHACELIA GLANDULOSA VAR DESERTA) in southwest Wyoming. Report prepared for the Bureau of Land Management Wyoming State Office by the Wyoming Natural Diversity Database, Laramie, Wyoming. (U99FER04WYUS)

*****BOECHERA SELBYI**
EOCODE: PDBRA061T0*003*WY

Dorn, Robert D. Botanical Consultant, Mountain West Environmental Services, Box 1471, Cheyenne, WY 82003. (307) 634-6328. (PNDDOR01WYUS)

*****ASTRAGALUS BISULCATUS VAR HAYDENIANUS**
EOCODE: PDFAB0F1B2*002*WY

Rocky Mountain Herbarium, University of Wyoming, Department of Botany, P.O. Box 3165 University Station, Laramie, WY 82071. (307) 766-2236. (ONDRMH01WYUS)

*****ERIGERON COMPACTUS VAR. CONSIMILIS**
EOCODE: PDAST3M550*004*WY

Rocky Mountain Herbarium, University of Wyoming, Department of Botany, P.O. Box 3165 University Station, Laramie, WY 82071. (307) 766-2236. (ONDRMH01WYUS)

*****ANDROSTEPHIUM BREVIFLORUM**
EOCODE: PMLIL06010*002*WY

Dorn, Robert D. Botanical Consultant, Mountain West Environmental Services, Box 1471, Cheyenne, WY 82003. (307) 634-6328. (PNDDOR01WYUS)

*****POPULUS DELTOIDES VAR WISLIZENII**
EOCODE: PDSAL01043*002*WY

Dorn, Robert D. Botanical Consultant, Mountain West Environmental Services, Box 1471, Cheyenne, WY 82003. (307) 634-6328. (PNDDOR01WYUS)

*****SENECIO SPARTIOIDES VAR MULTICAPITATUS**
EOCODE: PDAST8H250*004*WY

Ward, B., B.E. Nelson, and R.L. Hartman. 1998. Final report on the general floristic inventory of south-central Wyoming. Report prepared for the Bureau of Land Management Rawlins and Rock Springs districts by the Rocky Mountain Herbarium, University of Wyoming. 18 pp. + app. (U98WAR01WYUS)

*****ANDROSTEPHIUM BREVIFLORUM**
EOCODE: PMLIL06010*003*WY

Dorn, Robert D. Botanical Consultant, Mountain West Environmental Services, Box 1471, Cheyenne, WY 82003. (307) 634-6328. (PNDDOR01WYUS)

*****GILA ROBUSTA**
EOCODE: AFCJB13150*023*WY

Wheeler, C.A. 1997. Current distributions and distributional changes of fish in Wyoming west of the Continental Divide. M.S. thesis. University of Wyoming, Laramie, WY. (U97WHE01WYUS)

*****ANDROSTEPHIUM BREVIFLORUM**
EOCODE: PMLIL06010*001*WY

Rocky Mountain Herbarium, University of Wyoming, Department of Botany, P.O. Box 3165 University Station, Laramie, WY 82071. (307) 766-2236. (ONDRMH01WYUS)

*****POPULUS DELTOIDES VAR WISLIZENII**
EOCODE: PDSAL01043*003*WY

Dorn, Robert D. Botanical Consultant, Mountain West Environmental Services, Box 1471, Cheyenne, WY 82003. (307) 634-6328. (PNDDOR01WYUS)

*****OPUNTIA POLYACANTHA VAR RUFISPINA**
EOCODE: PDCAC0D103*003*WY

Ward, B., B.E. Nelson, and R.L. Hartman. 1998. Final report on the general floristic inventory of south-central Wyoming. Report prepared for the Bureau of Land Management Rawlins and Rock Springs districts by the Rocky Mountain Herbarium, University of Wyoming. 18 pp. + app. (U98WAR01WYUS)

*****PENSTEMON GIBBENSII**
EOCODE: PDSCR1L6U0*003*WY

Fertig, W. and M.L. Neighbours. 1996. Status report on PENSTEMON GIBBENSII in south-central Wyoming. Unpublished report prepared for the Bureau of Land Management Wyoming State Office and Rawlins District by the Wyoming Natural Diversity Database, 31 January 1996. XX pp. (U96FER01WYUS)

Dorn, R.D. 1989. Report on the status of Penstemon gibbensii, a candidate Threatened species. Unpublished report prepared for the US Fish and Wildlife Service by Mountain West Environmental Services, Cheyenne, Wyoming. (U89DOR09WYUS)

Dorn, Robert D. Botanical Consultant, Mountain West Environmental Services, Box 1471, Cheyenne, WY 82003. (307) 634-6328. (PNDDOR01WYUS)

Fertig, Walter. Botanist. Wyoming Natural Diversity Database, University of Wyoming, PO Box 3381, Laramie, Wyoming 82071. (307) 766-3020. (PNDFER01WYUS)

Neighbours, M. L. Data manager, Wyoming Natural Diversity Database, 1604 Grand Ave., Suite #2, Laramie, WY 82070. (307) 745-5026. (PNDNEI01WYUS)

*****POPULUS DELTOIDES VAR WISLIZENII**
EOCODE: PDSAL01043*001*WY

Dorn, Robert D. Botanical Consultant, Mountain West Environmental Services, Box 1471, Cheyenne, WY 82003. (307) 634-6328. (PNDDOR01WYUS)

*****GALIUM COLORADOENSE**
EOCODE: PDRUB0N0L0*002*WY

Rocky Mountain Herbarium, University of Wyoming, Department of Botany, P.O. Box 3165 University Station, Laramie, WY 82071. (307) 766-2236. (ONDRMH01WYUS)

*****DESCURAINIA PINNATA SSP PAYSONII**
EOCODE: PDBRA0X03K*001*WY

Rocky Mountain Herbarium, University of Wyoming, Department of Botany, P.O. Box 3165 University Station, Laramie, WY 82071. (307) 766-2236. (ONDRMH01WYUS)

*****ERIGERON COMPACTUS VAR. CONSIMILIS**
EOCODE: PDAST3M550*006*WY

Rocky Mountain Herbarium, University of Wyoming, Department of Botany, P.O. Box 3165 University Station, Laramie, WY 82071. (307) 766-2236. (ONDRMH01WYUS)

*****PENSTEMON GIBBENSII**
EOCODE: PDSCR1L6U0*002*WY

Fertig, W. and M.L. Neighbours. 1996. Status report on PENSTEMON GIBBENSII in south-central Wyoming. Unpublished report prepared for the Bureau of Land Management Wyoming State Office and Rawlins District by the Wyoming Natural Diversity Database, 31 January 1996. XX pp. (U96FER01WYUS)

Dorn, R.D. 1989. Report on the status of Penstemon gibbensii, a candidate Threatened species. Unpublished report prepared for the US Fish and Wildlife Service by Mountain West Environmental Services, Cheyenne, Wyoming. (U89DOR09WYUS)

Dorn, Robert D. Botanical Consultant, Mountain West Environmental Services, Box 1471, Cheyenne, WY 82003. (307) 634-6328. (PNDDOR01WYUS)

Fertig, Walter. Botanist. Wyoming Natural Diversity Database, University of Wyoming, PO Box 3381, Laramie, Wyoming 82071. (307) 766-3020. (PNDFER01WYUS)

*****SENECIO SPARTIOIDES VAR MULTICAPITATUS**
EOCODE: PDAST8H250*003*WY

Rocky Mountain Herbarium, University of Wyoming, Department of Botany, P.O. Box 3165 University Station, Laramie, WY 82071. (307) 766-2236. (ONDRMH01WYUS)

*****GALIUM COLORADOENSE**
EOCODE: PDRUB0N0L0*004*WY

Dorn, Robert D. Botanical Consultant, Mountain West Environmental Services, Box 1471, Cheyenne, WY 82003. (307) 634-6328. (PNDDOR01WYUS)

*****BOECHERA CRANDALLII**
EOCODE: PDBRA060A0*001*WY

Rocky Mountain Herbarium, University of Wyoming, Department of Botany, P.O. Box 3165 University Station, Laramie, WY 82071. (307) 766-2236. (ONDRMH01WYUS)

*****OPUNTIA POLYACANTHA VAR RUFISPINA**
EOCODE: PDCAC0D103*005*WY

Ward, B., B.E. Nelson, and R.L. Hartman. 1998. Final report on the general floristic inventory of south-central Wyoming. Report prepared for the Bureau of Land Management Rawlins and Rock Springs districts by the Rocky Mountain Herbarium, University of Wyoming. 18 pp. + app. (U98WAR01WYUS)

*****PHACELIA TETRAMERA**
EOCODE: PDHYD0C4K0*001*WY

Rocky Mountain Herbarium, University of Wyoming, Department of Botany, P.O. Box 3165 University Station, Laramie, WY 82071. (307) 766-2236. (ONDRMH01WYUS)

Wyoming Natural Diversity Database

15 February 2002

Plant Species of Concern
In T13-16N and R93-96W and one township buffer
For Melody Smith, BKS Environmental.

Tracked Species

Plants

Scientific Name	Common Name	Federal Status	Management Status	Global Rank/ State Rank	Tracked by WYNDD?	Wyoming Distribution Note	Number of Occurrences in Area
ANDROSTEPHIUM BREVIFLORUM	PURPLE FUNNEL-LILY			G5/S1	Y	PERIPHERAL	4
ASTRAGALUS BISULCATUS VAR HAYDENIANUS	HAYDEN'S MILKVETCH			G5T4?/S1	Y	REGIONAL ENDEMIC	1
ASTRAGALUS NELSONIANUS	NELSON'S MILKVETCH		WY BLM SSL	G2/S2	Y	REGIONAL ENDEMIC	1
ATRIPLEX WOLFII	WOLF'S ORACHE			G3G4/S1	Y	REGIONAL ENDEMIC	2
BOECHERA CRANDALLII	CRANDALL'S ROCKCRESS			G2/S1	Y	REGIONAL ENDEMIC	1
BOECHERA SELBYI	SELBY ROCKCRESS			G4?Q/S1	Y	PERIPHERAL	1
CHRYSOTHAMNUS GREENEI	GREENE RABBITBRUSH			G5/S1?	Y	PERIPHERAL	1
DESCURAINIA PINNATA SSP PAYSONII	PAYSON'S TANSYMUSTARD			G5T3?/S2	Y	PERIPHERAL?	2
ERIGERON COMPACTUS VAR. CONSIMILIS	SAN RAFAEL DAISY			G4G5/S1	Y	REGIONAL ENDEMIC	3
GALIUM COLORADOENSE	COLORADO BEDSTRAW			G4/S1	Y	PERIPHERAL	2
OPUNTIA POLYACANTHA VAR RUFISPINA	RUFOUS-SPINE PRICKLY-PEAR			G5T5/S2	Y	PERIPHERAL	2
PENSTEMON GIBBENSII	GIBBENS' BEARDTONGUE		WY BLM SSL	G1/S1	Y	REGIONAL ENDEMIC	3
PHACELIA GLANDULOSA VAR DESERTA	DESERT GLANDULAR PHACELIA			G4T1T2/S1?	Y		1
PHACELIA TETRAMERA	TINY PHACELIA			G4/S1	Y	PERIPHERAL	1
POPULUS DELTOIDES VAR WISLIZENII	FREMONT COTTONWOOD			G5T?/S1	Y	PERIPHERAL	3
SENECIO SPARTIOIDES VAR MULTICAPITATUS	MANY-HEADED BROOM GROUNDSEL			G4/S1	Y	PERIPHERAL	3

Wyoming Natural Diversity Database

15 February 2002

Plant Species of Concern
In T13-16N and R93-96W and one township buffer
For Melody Smith, BKS Environmental.

This list is sorted by Township and Range.

***Township and Range Section	Scientific Name (Common Name)	Occurrence Number	Occurrence Type	Occurrence Date
*** T12N R92W				
04	ANDROSTEPHIUM BREVIFLORUM (PURPLE FUNNEL-LILY)	001	SPECIMEN	1968-07-27
05	BOECHERA CRANDALLII (CRANDALL'S ROCKCRESS)	001	SPECIMEN	1968-06-08
*** T12N R93W				
01	ANDROSTEPHIUM BREVIFLORUM (PURPLE FUNNEL-LILY)	002	SPECIMEN	1979-05-25
03-04,08-09	PENSTEMON GIBBENSII (GIBBENS' BEARDTONGUE)	002	SURVEY	1995-07-11
04	ATRIPLEX WOLFII (WOLF'S ORACHE)	004	SPECIMEN	1970-08-14
SENSITIVE DATA	POPULUS DELTOIDES VAR WISLIZENII (FREMONT COTTONWOOD)	001	SPECIMEN	1987-09-23
*** T12N R94W				
06,16-17	ERIGERON COMPACTUS VAR. CONSIMILIS (SAN RAFAEL DAISY)	002	SPECIMEN	1997-06-17
08	POPULUS DELTOIDES VAR WISLIZENII (FREMONT COTTONWOOD)	003	SPECIMEN	1994-05-30
10	PENSTEMON GIBBENSII (GIBBENS' BEARDTONGUE)	001	SURVEY	1999-06-21
*** T12N R95W				
02,12	ERIGERON COMPACTUS VAR. CONSIMILIS (SAN RAFAEL DAISY)	002	SPECIMEN	1997-06-17
24	ANDROSTEPHIUM BREVIFLORUM (PURPLE FUNNEL-LILY)	003	SPECIMEN	1993-05-30

***Township and Range

Section	Scientific Name (Common Name)	Occurrence Number	Occurrence Type	Occurrence Date
*** T12N R96W				
05				
	ERIGERON COMPACTUS VAR. CONSIMILIS (SAN RAFAEL DAISY)	004	SPECIMEN	1980-07-01
18				
	BOECHERA SELBYI (SELBY ROCKCRESS)	003	SPECIMEN	1994-05-30
*** T13N R94W				
23				
	ATRIPLEX WOLFII (WOLF'S ORACHE)	003	SPECIMEN	1967-08-07
30				
	GALIUM COLORADOENSE (COLORADO BEDSTRAW)	002	SPECIMEN	1970-09-28
*** T13N R95W				
35-36				
	ERIGERON COMPACTUS VAR. CONSIMILIS (SAN RAFAEL DAISY)	002	SPECIMEN	1997-06-17
*** T13N R96W				
15				
	POPULUS DELTOIDES VAR WISLIZENII (FREMONT COTTONWOOD)	002	SPECIMEN	1987-08-29
32				
	ERIGERON COMPACTUS VAR. CONSIMILIS (SAN RAFAEL DAISY)	006	SPECIMEN	1980-06-12
*** T13N R97W				
16				
	SENECIO SPARTIOIDES VAR MULTICAPITATUS (MANY-HEADED BROOM GROUNDSEL)	002	SPECIMEN	1987-08-29
32				
	CHRYSOTHAMNUS GREENEI (GREENE RABBITBRUSH)	001	SPECIMEN	1987-08-29
*** T14N R93W				
03,10				
	PENSTEMON GIBBENSII (GIBBENS' BEARDTONGUE)	003	SURVEY	1995-08-24

***Township and Range Section	Scientific Name (Common Name)	Occurrence Number	Occurrence Type	Occurrence Date
*** T14N R94W				
01				
	OPUNTIA POLYACANTHA VAR RUFISPINA (RUFOUS-SPINE PRICKLY-PEAR)	003	SPECIMEN	1996-07-10
31				
	GALIUM COLORADOENSE (COLORADO BEDSTRAW)	004	SPECIMEN	1991-06-28
*** T15N R93W				
16				
	ANDROSTEPHIUM BREVIFLORUM (PURPLE	004	SPECIMEN	1983-06-08
*** T15N R94W				
04				
	PHACELIA GLANDULOSA VAR DESERTA (DESERT GLANDULAR PHACELIA)	003	SPECIMEN	1996-07-10
31				
	OPUNTIA POLYACANTHA VAR RUFISPINA (RUFOUS-SPINE PRICKLY-PEAR)	005	SPECIMEN	1996-07-20
*** T15N R97W				
28				
	DESCURAINIA PINNATA SSP PAYSONII (PAYSON'S TANSYMUSTARD)	001	SPECIMEN	1984-06-20
*** T16N R95W				
22,27				
	SENECIO SPARTIOIDES VAR MULTICAPITATUS (MANY-HEADED BROOM GROUNDSEL)	004	SPECIMEN	1996-08-15

***Township and Range

Section	Scientific Name (Common Name)	Occurrence Number	Occurrence Type	Occurrence Date
*** T16N R97W				
18				
	DESCURAINIA PINNATA SSP PAYSONII (PAYSON'S TANSYMUSTARD)	006	SPECIMEN	1996-06-12
28				
	SENECIO SPARTIOIDES VAR MULTICAPITATUS (MANY-HEADED BROOM GROUNDSEL)	003	SPECIMEN	1980-08-08
*** T17N R92W				
33				
	ASTRAGALUS BISULCATUS VAR HAYDENIANUS (HAYDEN'S MILKVETCH)	002	SPECIMEN	1945-07-05
*** T17N R94W				
06				
	ASTRAGALUS NELSONIANUS (NELSON'S MILKVETCH)	007	SPECIMEN	1996-06-07
*** T17N R96W				
28				
	PHACELIA TETRAMERA (TINY PHACELIA)	001	SPECIMEN	1983-06-24
*** T18N R95W				
34				
	ASTRAGALUS NELSONIANUS (NELSON'S MILKVETCH)	007	SPECIMEN	1996-06-07

Botanical Comments on Sweetwater/Carbon counties
T13-16N R93-96W
For Melody Smith, BKS Environmental

There are no federally Threatened or Endangered plant species known or suspected from the project area. However, 3 of the 4 known occurrences of Gibben's beardtongue are present. It is a Wyoming BLM sensitive species and regional endemic of south-central Wyoming and immediately adjacent northwestern Colorado, and northeastern Utah, ranked "G1" (critically imperiled throughout its range). Gibbens' beardtongue is found primarily on barren shale or sandstone slopes of the Browns Park Formation or Laney member of the Green River shale. Populations typically are found in sparsely vegetated grasslands of *Elymus spicatus, Oryzopsis hymenoides*, and *Stipa comata* with scattered shrubs. A status survey for the species was conducted in the project area by Walter Fertig (Fertig 1996) and the results of this study are summarized in the state species abstract ("WYNDD summary".)

The only other Wyoming plant species of special concern that is a regional endemic is Crandall's rockcress (*Boechera crandallii*; syn.: *Arabis crandallii*). It is a regional endemic of southwest Colorado (Gunnison, Hinsdale, and Montrose counties) and southwest Wyoming (Carbon and Sweetwater counties) and ranked "G2" (imperiled throughout its range.) It is found in sagebrush scrub and Utah juniper/mountain mahogany communities on shaley slopes or sandstone ridges and ledges.

There are six other Wyoming plant species of special concern in the project area. The project area contains at least half of the known occurrences in the state for two that are at the northern limits of their range here, including Purple funnel-lily (*Androstephium breviflorum*) and Fremont cottonwood (*Populus deltoides* var. *wislizeni*).

Additional information on these state plant species of special concern in the project area are provided on the WYNDD homepage (http://www.uwyo.edu/wyndd).

-Bonnie Heidel, bheidel@uwyo.edu; 8 April 2002

APPENDIX F

WILDLIFE:

Wildlife and Fish Species List

U.S. Fish and Wildlife Service Letter

APPENDIX F

WILDLIFE

Table 1. Wildlife and fish species observed or that may potentially occur on or near the Desolation Flats Project Area.

Common Name	Scientific Name	WOS	ATLAS	WYNDD	HWA	BLM	FOW
		Data Sources*					
MAMMALS							
Badger	*Taxidea taxus*	y	y		y		
Beaver	*Castor canadensis*	y	y				
Big-brown bat	*Eptesicus fuscus*		y				
Bison	*Bison bison*	y	y				
Black bear	*Ursus americanus*	y	y				
Black-footed ferret	*Mustela nigripes*		y				
Bobcat	*Felis rufus*	y	y				
Bushy-tailed wood rat	*Neotoma cinerea*	y	y				
Cliff chipmunk	*Tamias dorsalis*	y	y				
Coyote	*Canis latrans*	y	y		y		
Deer mouse	*Peromyscus maniculatus*	y	y				
Desert cottontail	*Sylvilagus audubonii*	y	y				
Dusky shrew	*Sorex monticolus*		y				
Dwarf shrew	*Sorex nanus*		y			y	
Eastern cottontail	*Sciurus carolinensis*	y					
Eastern red bat	*Lasiurus borealis*		y				
Eastern fox squirrel	*Sciurus niger*		y				
Elk	*Cervus elaphus*	y	y				
Fringed myotis	*Myotis thysanodes*					y	
Golden-mantled groundsquirrel	*Spermophilus lateralis*	y	y				
Great Basin pocket mouse	*Perognathus parvus*		y				
Grizzly bear	*Ursus arctos*		y				
Hoary bat	*Lasiurus cinereus*		y				
Idaho pocket gopher	*Thomomys idahoensis*					y	
Least chipmunk	*Tamias minimus*	y	y				
Little brown myotis	*Myotis lucifugus*		y				
Long-eared myotis	*Myotis evotis*		y			y	
Long-legged myotis	*Myotis volans*		y				
Long-tailed vole	*Microtus longicaudus*		y				
Long-tailed weasel	*Mustela frenata*	y	y		y		
Marten	*Martes americana*		y				
Masked shrew	*Sorex cinereus*		y				
Meadow jumping mouse	*Zapus hudsonius*		y				
Meadow vole	*Microtus pennsylvanicus*		y				
Merriam's shrew	*Sorex merriami*		y				
Mink	*Mustela vison*		y				
Montane vole	*Microtus montanus*		y				
Moose	*Alces alces shirasi*	y	y				
Mountain (Nuttall's) cottontail	*Sylvilagus nuttallii*	y	y				
Mountain lion	*Felis concolor*	y	y				
Mule deer	*Odocoileus hemionus*	y	y				
Muskrat	*Ondatra zibethicus*	y	y				
Northern grasshopper mouse	*Onychomys leucogaster*	y	y				
Northern pocket gopher	*Thomomys talpoides*		y				
Olive-backed pocket mouse	*Perognathus fasciatus*	y	y				
Ord's kangaroo rat	*Dipodomys ordii*	y	y				

Table 1 Continued.

Common Name	Scientific Name	Data Sources* WOS	ATLAS	WYNDD	HWA	BLM	FOW
Pika	*Ochotona princeps*		y				
Pinyon mouse	*Peromyscus truei*	y	y				
Porcupine	*Erethizon dorsatum*		y				
Pronghorn antelope	*Antilocapra americana*	y	y				
Pygmy rabbit	*Brachylagus idahoensis*		y			y	
Raccoon	*Procyon lotor*	y	y				
Red fox	*Vulpes vulpes*	y	y				
Red squirrel	*Tamiasciurus hudsonicus*		y				
Sagebrush vole	*Lemmiscus curtatus*		y				
Short-tailed (ermine) weasel	*Mustela erminea*		y				
Silky pocket mouse	*Perognathus flavus*	y	y				
Silver-haired bat	*Lasionycteris noctivagans*		y				
Snowshoe hare	*Lepus americanus*		y				
Southern red-backed vole	*Clethrionomys gapperi*		y				
Spotted bat	*Euderma maculatum*					y	
Spotted ground squirrel	*Spermophilus tridecemlineatus*		y				
Striped skunk	*Mephitis mephitis*	y	y				
Swift fox	*Vulpes velox*		y			y	
Thirteen-lined groundsquirrel	*Spermophilus tridecemlineatus*	y	y				
Townsend's big-eared bat	*Plecotus townsendii*					y	
Uinta chipmunk	*Tamius umbrinus*		y				
Uinta ground squirrel	*Spermophilus armatus*		y				
Water shrew	*Sorex palustris*		y				
Western heather vole	*Phenacomys intermedius*		y				
Western jumping mouse	*Zapus princeps*	y	y				
Western small-footed myotis	*Myotis ciliolabrum*	y	y				
White-tailed deer	*Odocoileus virginianus*	y	y				
White-tailed jackrabbit	*Lepus townsendii*	y	y				
White-tailed prairie dog	*Cynomys leucurus*	y	y			y	
Wild horse	*Equus caballus*	y					
Wyoming ground squirrel	*Spermophilus elegans*		y				
Wyoming pocket gopher	*Thomomys clusius*		y			y	
Yellow-bellied marmot	*Marmota flaviventris*		y				
Yellow-pine chipmunk	*Tamius amoenus*		y				
BIRDS							
Acorn woodpecker	*Melanerpes formicivorus*		y				
American avocet	*Recurvirostra americana*	y	y				
American bittern	*Botaurus lentiginosus*		y				
American coot	*Fulica americana*	y	y				
American crow	*Corvus brachyrhynchos*		y				
American dipper	*Cinclus mexicanus*		y				
American goldfinch	*Carduelis tristis*		y				
American kestrel	*Falco sparverius*	y	y		y		
American pipit	*Anthus rubescens*		y				
American redstart	*Setophaga ruticilla*		y				
American robin	*Turdus migratorius*	y	y				
American tree sparrow	*Spizella arborea*		y				
American white pelican	*Pelecanus erythrorhynchos*		y				
American wigeon	*Anas Americana*	y	y				
Anna's hummingbird	*Calypte anna*	y					
Ash-throated flycatcher	*Myiarchus cinerascens*	y	y				

Table 1 Continued.

Common Name	Scientific Name	Data Sources* WOS	ATLAS	WYNDD	HWA	BLM	FOW
Baird's sandpiper	*Calidris bairdii*		y				
Baird's sparrow	*Ammodramus bairdii*					y	
Bald eagle	*Haliaeetus luecocephalus*	y	y		y		
Bank swallow	*Riparia riparia*	y	y		y		
Barn owl	*Tyto alba*		y				
Barn swallow	*Hirundo rustica*	y	y				
Barrow's goldeneye	*Bucephala islandica*		y				
Belted kingfisher	*Ceryle alcyon*	y	y				
Bewick's wren	*Thryomanes bewickii*	y	y				
Black rosy-finch	*Leucosticte atrata*		y				
Black tern	*Chlidonias niger*		y				
Black-and-white warbler	*Mniotilta varia*		y				
Black-bellied plover	*Pluvialis dominicus*		y				
Black-billed cuckoo	*Coccyzus erythropthalmus*		y				
Black-billed magpie	*Pica pica*	y	y				
Black-capped chickadee	*Parus atricapillus*		y				
Black-crowned night heron	*Nycticorax nycticorax*		y				
Black-headed grosbeak	*Pheucticus melanocephalus*		y				
Black-necked stilt	*Himantopus mexicanus*		y				
Black-throated gray warbler	*Dendroica caerulescens*	y	y				
Black-throated sparrow	*Amphispiza bilineata*		y				
Blue grosbeak	*Guiraca caerulea*		y				
Blue grouse	*Dendragapus obscurus*		y				
Blue jay	*Cyanocitta cristata*		y				
Blue-gray gnatcatcher	*Polioptila caerulea*	y	y				
Blue-winged teal	*Anas discors*	y	y				
Bobolink	*Dolichonyx oryzivorus*		y				
Bohemian waxwing	*Bombycilla garrulus*		y				
Bonaparte's gull	*Spizella breweri*	y	y				
Brewer's sparrow	*Euphagus cyanocephalus*	y	y			y	
Brewer's blackbird	*Selasphorus platycercus*	y	y				
Broad-tailed hummingbird	Selasphorus platycercus		y				
Broad-winged hawk	*Buteo platypterus*		y				
Brown creeper	*Certhia americana*		y				
Brown thrasher	*Taxostoma rufum*		y				
Brown-capped rosy-finch	*Leucosticte australis*		y				
Brown-headed cowbird	*Molothrus ater*	y	y				
Buff-breasted sandpiper	*Tryngites subruficollis*		y				
Bufflehead	*Bucephala albeola*	y	y				
Burrowing owl	*Athene cunicularia*	y	y	y	y	y	
Bushtit	*Psaltriparus minimus*	y	y				
California gull	*Larus californicus*		y				
Calliope hummingbird	*Stellula calliope*		y				
Canada goose	*Branta canadensis*	y	y				
Canvasback	*Aythya valisineria*		y				
Canyon wren	*Catherpes mexicanus*	y	y				
Caspian tern	*Sterna caspia*		y				
Cassin's finch	*Carpodacus cassinii*		y				
Cattle egret	*Bubulcus ibis*		y				
Cedar waxwing	*Bombycilla cedrorum*		y				
Chestnut-collared longspur	*Calcarius ornatus*		y				

Table 1 Continued.

Common Name	Scientific Name	Data Sources* WOS	ATLAS	WYNDD	HWA	BLM	FOW
Chipping sparrow	*Spizella passerina*	y	y				
Cinnamon teal	*Anas cyanoptera*	y	y				
Clark's grebe	*Aechmophorus clarkii*		y				
Clark's nutcracker	*Nucifraga columbiana*	y	y				
Clay-colored sparrow	*Spizella pallida*		y				
Cliff swallow	*Hirundo pyrrhonota*	y	y		y		
Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*		y			y	
Common goldeneye	*Bucephala clangula*		y				
Common grackle	*Quiscalus quiscula*		y				
Common merganser	*Mergus merganser*	y	y				
Common nighthawk	*Chordeiles minor*	y	y		y		
Common poorwill	*Phalaenoptilus nuttallii*	y	y				
Common raven	*Corvus corax*		y				
Common redpoll	*Carduelis flammea*		y				
Common snipe	*Gallinago gallinago*		y				
Common tern	*Sterna hirundo*		y				
Common yellowthroat	*Geothylpis trichas*		y		y		
Common loon	*Gavia immer*		y				
Cooper's hawk	*Accipiter cooperii*	y	y		y		
Cordilleran fly catcher	*Empidonax occidentalis*		y				
Dark-eyed junco	*Junco hyemalis*	y	y				
Double-crested cormorant	*Phalacrocorax auritus*		y				
Downy woodpecker	*Picoides pubescens*	y	y				
Dunlin	*Calidris alpina*		y				
Dusky flycatcher	*Empidonax oberholseri*	y	y				
Eared grebe	*Podiceps nigricollis*	y	y				
Eastern kingbird	*Tyrannus tyrannus*		y				
European starling	*Sturnus vulgaris*		y				
Evening grosbeak	*Coccothraustes vespertinus*		y				
Ferruginous hawk	*Buteo regalis*	y	y		y	y	
Forster's tern	*Sterna forsteri*		y				
Fox sparrow	*Passerella iliaca*		y				
Franklin's gull	*Larus pipixcan*	y	y				
Gadwall	*Anas strepera*	y	y				
Golden eagle	*Aquila chrysaetos*	y	y		y		
Golden-crowned kinglet	*Regulus satrapa*		y				
Gray catbird	*Dumetella carolinensis*		y				
Gray flycatcher	*Empidonax wrightii*	y	y				
Gray jay	*Perisoreus canadensis*		y				
Gray-crowned rosy-finch	*Leucosticte tephrocotis*		y				
Great-blue heron	*Ardea herodias*	y	y				
Greater prairie chicken	*Tympanuchus cupido*	y					
Greater yellowlegs	*Tringa melanoleuca*	y	y				
Great horned owl	*Bubo virginianus*	y	y				
Green heron	*Butorides virescens*	y	y				
Green-tailed towhee	*Pipilo chlorurus*	y	y				
Green-winged teal	*Anas crecca*	y	y				
Hairy woodpecker	*Picoides villosus*		y				
Hammond's flycatcher	*Empidonax hammondii*		y				
Hermit thrush	*Catharus guttatus*		y				
Herring gull	*Larus argentatus*		y				

Table 1 Continued.

Common Name	Scientific Name	Data Sources* WOS	ATLAS	WYNDD	HWA	BLM	FOW
Hooded merganser	*Lophodytes cucullatus*		y				
Horned grebe	*Podiceps auritus*		y				
Horned lark	*Eremophila alpestris*	y	y		y		
House finch	*Carpodacus mexicanus*	y	y				
House sparrow	*Passer domesticus*		y				
House wren	*Troglodytes aedon*	y	y				
Indigo bunting	*Passerina cyanea*		y				
Killdeer	*Charadrius vociferus*	y	y		y		
Lark bunting	*Calamospiza melanocorys*	y	y		y		
Lark sparrow	*Chondestes grammacus*	y	y				
Lazuli bunting	*Passerina ameoena*		y				
Least flycatcher	*Empidonax minimus*		y				
Least sandpiper	*Calidris minutilla*		y				
Lesser scaup	*Aythya affinis*	y	y				
Lesser yellowlegs	*Tringa flavipes*		y				
Lewis' woodpecker	*Melanerpes lewis*		y				
Lincoln's sparrow	*Melospiza lincolnii*		y				
Loggerhead shrike	*Lanius ludovicianus*	y	y		y	y	
Long-billed curlew	*Numenius americanus*	y	y			y	
Long-billed dowitcher	*Limnodromus scolopaceus*	y	y				
Long-eared owl	*Asio otus*	y	y				
Macgillivray's warbler	*Oporornis tolmiei*		y				
Mallard	*Anas platyrhynchos*	y	y				
Marbled godwit	*Limosa fedora*		y				
Marsh wren	*Cistothorus palustris*		y				
McCown's longspur	*Calcarius mccownii*		y				
Merlin	*Falco columbarius*		y				
Mountain bluebird	*Sialia currucoides*	y	y		y		
Mountain chickadee	*Parus gambeli*	y	y				
Mountain plover	*Charadrius montanus*	y	y	y	y		
Mourning dove	*Zenaida macroura*	y	y		y		
Nashville warbler	*Vermivora ruficapilla*	y	y				
Northern (Bullock's) oriole	*Icterus bullockii*	y					
Northern flicker	*Colaptes auratus*	y	y		y		
Northern goshawk	*Accipiter gentilis*	y	y			y	
Northern harrier	*Circus cyaneus*	y	y		y		
Northern mockingbird	*Mimus polyglottos*		y				
Northern pintail	*Anas acuta*		y				
Northern rough-winged swallow	*Stelgidopteryx serripennis*		y				
Northern saw-whet owl	Aegolius acadicus		y				
Northern shoveler	*Anas clypeata*	y	y				
Northern shrike	*Lanius excubitor*	y	y				
Northern waterthrush	*Seiurus noveboracensis*		y				
Oldsquaw	*Clangula hyemalis*		y				
Olive-sided flycatcher	*Contopus borealis*		y				
Orange-crowned warbler	*Vermivora celata*		y				
Ovenbird	*Seiurus aurocapillus*		y				
Pacific loon	*Gavia pacifica*		y				
Pectoral sandpiper	*Calidris melanotos*		y				
Peregrine falcon	*Falco peregrinus*		y			y	
Pied billed grebe	*Podilymbus podiceps*		y				

Table 1 Continued.

Common Name	Scientific Name	WOS	ATLAS	WYNDD	HWA	BLM	FOW
		Data Sources*					
Pine grosbeak	*Pinicola enucleator*		y				
Pine siskin	*Carduelis pinus*	y	y				
Pinyon jay	*Gymnorhinus cyanocephalus*	y	y				
Plain titmouse	*Baeolophus griseus*	y					
Prairie falcon	*Falco mexicanus*	y	y		y		
Red crossbill	*Loxia curvirostra*		y				
Red knot	*Calidris canutus*		y				
Red phalarope	*Phalaropus fulicaria*		y				
Red-breasted merganser	*Mergus serrator*		y				
Red-breasted nuthatch	*Sitta canadensis*	y	y				
Red-eyed vireo	*Vireo olivaceus*		y				
Redhead	*Aythya americana*	y	y				
Red-headed woodpecker	*Melanerpes erythrocephalus*		y				
Red-naped sapsucker	*Sphyrapicus nuchalis*		y				
Red-necked grebe	*Podiceps grisegena*		y				
Red-necked phalarope	*Phalaropus lobatus*	y	y				
Red-tailed hawk	*Buteo jamaicensis*	y	y		y		
Red-winged blackbird	*Agelaius phoeniceus*	y	y				
Ring-billed gull	*Larus delawarensis*		y				
Ring-necked duck	*Aythya collaris*	y	y				
Rock dove	*Columba livia*		y				
Rock wren	*Salpinctes obsoletus*	y	y				
Rose-breasted grosbeak	*Pheucticus ludovicianus*		y				
Ross' goose	*Chen rosii*		y				
Rough-legged hawk	*Buteo lagopus*	y	y				
Ruby-crowned kinglet	*Regulus calendula*	y	y				
Ruddy duck	*Oxyura jamaicensis*	y	y				
Ruddy turnstone	*Arenaria interpres*		y				
Rufous hummingbird	*Selasphorus rufus*		y				
Sabine's gull	*Xema sabini*		y				
Sage grouse, greater	*Centrocercus urophasianus*	y	y		y	y	
Sage sparrow	*Amphispiza belli*	y	y			y	
Sage thrasher	*Oreoscoptes montanus*	y	y		y	y	
Sanderling	*Calidris alba*		y				
Sandhill crane	*Grus canadensis*	y	y				
Savannah sparrow	*Passerculus sandwichensis*		y				
Say's phoebe	*Sayornis saya*	y	y		y		
Scott's oriole	*Icterus parisorum*	y	y	y			
Semipalmated plover	*Charadrius semiplamatus*		y				
Semipalmated sandpiper	*Calidris pusilla*		y				
Sharp-shinned hawk	*Accipiter striatus*	y	y				
Short eared owl	*Asio flammeus*	y	y				
Short-billed dowitcher	*Limnodromus griseus*		y				
Snow bunting	*Plectrophenax nivalis*		y				
Snow goose	*Chen caerulescens*		y				
Snowy egret	*Egretta thula*		y				
Snowy owl	*Nyctea scandiaca*		y				
Snowy plover	*Charadrius alexandrinus*		y	y			
Sora	*Porzana carolina*		y				
Solitary sandpiper	*Tringa solitaria*		y				
Solitary vireo	*Vireo solitarius*		y				

Table 1 Continued.

Common Name	Scientific Name	WOS	ATLAS	WYNDD	HWA	BLM	FOW
		Data Sources*					
Song sparrow	*Melospiza melodia*		y				
Spotted sandpiper	*Actitis macularia*		y				
Spotted towhee	*Pipilo maculatus*		y				
Steller's jay	*Cyanocitta stelleri*		y				
Stilt sandpiper	*Calidris himantopus*		y				
Surf scoter	*Melanitta perspicillata*		y				
Swainson's hawk	*Buteo swainsoni*	y	y		y		
Swainson's thrush	*Catharus ustulatus*	y	y				
Swamp sparrow	*Melospiza georgiana*		y				
Tennessee warbler	*Vermivora peregrina*		y				
Three-toed woodpecker	*Picoides tridactylus*	y	y				
Townsend's solitaire	*Myadestes townsendii*		y				
Townsend's warbler	*Dendroica townsendii*		y				
Tree swallow	*Tachycineta bicolor*		y				
Trumpeter swan	*Cygnus buccinator*	y	y			y	
Tundra swan	*Cygnus columbianus*		y				
Turkey vulture	*Cathartes aura*	y	y		y		
Veery	*Catharus fuscescens*		y				
Vesper sparrow	*Pooecetes gramineus*	y	y		y		
Violet-green swallow	*Tachycineta thalassina*	y	y				
Virginia rail	*Rallus limicola*		y				
Virginia's warbler	*Vermivora virginiae*		y				
Warbling vireo	*Vireo gilvus*		y				
Western bluebird	*Sialia mexicana*		y		y		
Western grebe	*Aechmophorus occidentalis*		y				
Western kingbird	*Tyrannus verticalis*	y	y		y		
Western meadowlark	*Sturnella neglecta*	y	y		y		
Western sandpiper	*Calidris mauri*		y				
Western scrub-jay	*Apheloma californica*	y	y				
Western tanager	*Piranga ludoviciana*	y	y				
Western wood-peewee	*Cantopus sordidulus*		y				
Whimbrel	*Numenius phaeopus*		y				
White-breasted nuthatch	*Sitta carolinensis*		y				
White-crowned sparrow	*Zonotrichia leucoophrys*		y				
White-faced ibis	*Plegadis chihi*	y	y			y	
White-throated swift	*Aeronautes saxatalis*	y	y				
White-winged crossbill	*Loxia leucoptera*		y				
White-winged scoter	*Melanitta fusca*		y				
Willet	*Catotrophorus semipalmatus*	y	y				
Williamson's sapsucker	*Sphyrapicus thyroideus*		y				
Willow flycatcher	*Empidonax traillii*		y				
Wilson's phalarope	*Phalaropus tricolor*	y	y				
Wilson's warbler	*Wilsonia pusilla*	y	y				
Wood duck	*Aix sponsa*		y				
Yellow warbler	*Dendroica petechia*		y				
Yellow-billed cuckoo	*Coccyzus americanus*					y	
Yellow-breasted chat	*Icteria virens*		y				
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*		y				
Yellow-rumped warbler	*Dendroica coronata*		y				

Common Name	Scientific Name	Data Sources*					
		WOS	ATLAS	WYNDD	HWA	BLM	FOW
AMPHIBIANS							
Boreal chorus frog	*Pseudacris triseriata maculata*		y				
Boreal toad	*Bufo boreas boreas*		y	y		y	
Great Basin spadefoot toad	*Scaphiopus intermontanus*	y	y			y	
Northern leopard frog	*Rana pipiens*		y	y		y	
Plains spadefoot toad	*Scaphiopus bombifrons*	y					
Spotted frog	*Rana pretiosa*					y	
Tiger salamander	*Ambystoma tigrinum*	y	y				
REPTILES							
Eastern short horned lizard	*Phrynosoma douglassi brevirostre*		y				
Great Basin gopher snake	*Pituophis melanoleucas deserticola*		y	y			
Many-lined skink	*Eumeces multivirgatus*		y				
Midget-faded rattlesnake	*Crotalus viridus concolor*					y	
Northern sagebrush lizard	*Sceloporus graciosus graciosus*		y				
Ornate box turtle	*Terrapene ornata ornata*		y				
Pale milk snake	*Lampropeltis triangulum multistrata*		y				
Prairie rattlesnake	*Crotalus vinidus vinidus*	y	y		y		
Wandering garter snake	*Thamnophis elegans vagrans*		y				
Western plains garter snake	*Thamnophis radix haydeni*		y				
Western smooth green snake	*Opheodrys vernalis blanchardi*		y	y			
Fish							
Bluehead sucker	*Catostomus discobolus*			y		y	y
Bonytail	*Gila elegans*			y			y
Brook trout	*Salvelinus fontinalis*						y
Brown trout	*Salmo trutta*						y
Channel catfish	*Ictalurus punctatus*						y
Colorado pikeminnow	*Ptychocheilus lucius*			y			y
Colorado River cutthroat trout	*Oncorhynchus clarki pleuriticus*			y		y	y
Common carp	*Cyprinus carpio*						y
Creek chub	*Semotitus atromaculatus*						y
Flannelmouth sucker	*Catostomus latipinnis*			y		y	y
Humpback chub	*Gila cypha*			y			y
Leatherside chub	*Gila copei*					y	y
Mottled sculpin	*Cottus bairdi*						y
Mountain sucker	*Catostomus platyrhynchus*						y
Mountain whitefish	*Prosopium williamsoni*						y
Rainbow trout	*Oncorhynchus mykiss*						y
Razorback sucker	*Xyrauchen texanus*			y			y
Redside shiner	*Richardsonius balteatus*						y
Roundtail chub	*Gila robusta*			y		y	y
Speckled dace	*Rhinichthys osculus*						y
White sucker	*Catostomus commersoni*						y

*Data Sources
- WGFD Wildlife Observation System (2000a)
- Atlas of Birds, Mammals, Reptiles and Amphibians in Wyoming (WGFD 1999)
- Wyoming Natural Diversity Database (2000)
- Hayden-Wing Associates Field Surveys During 2000, 2001
- BLM Wyoming Sensitive Species List (USDI-BLM 2001)
- Fishes of Wyoming (Baxter and Stone 1995)

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
4000 Airport Parkway
Cheyenne, Wyoming 82001

RECEIVED
SEP 27 2002
BUREAU OF LAND MANAGEMENT
RAWLINS FIELD OFFICE

ES-61411
at/W.02/wy6207.at

September 23, 2002

Memorandum:

To: Kurt Kotter, Field Manager, Bureau of Land Management, Rawlins Field Office. Rawlins, Wyoming

From: Mike Long, Field Supervisor, U.S. Fish and Wildlife Service, Wyoming Field Office, Cheyenne, Wyoming Mike Long

Subject: Updated Species for the Desolation Flats Natural Gas Development Project

Thank you for the request for an updated species list for the Desolation Flats Natural Gas Development Project in Carbon and Sweetwater counties, Wyoming.

In accordance with section 7(c) of the Endangered Species Act of 1973, as amended (Act), my staff has determined that the following threatened or endangered species, or species proposed for listing under the Act, may be present in the project area.

LISTED AND PROPOSED SPECIES

Species	Status	Expected Occurrence
Black-footed ferret (*Mustela nigripes*)	Endangered	Potential resident in prairie dog (*Cynomys* sp.) colonies.
Bald eagle (*Haliaeetus leucocephalus*)	Threatened	Nesting. Winter resident. Migrant.
Mountain plover (*Charadrius montanus*)	Proposed	Grasslands statewide
Ute ladies'-tresses (*Spiranthes diluvialis*)	Threatened	Seasonally moist soils and wet meadows of drainages below 6500 feet elevation.
Canada lynx (*Lynx canadensis*)	Threatened	Resident of forested areas

Kurt Kotter 2

Black-footed ferret
Black-footed ferrets may be affected if prairie dog colonies are impacted. If white-tailed prairie dog colonies or complexes greater than 200 acres will be disturbed, surveys for ferrets should be conducted even if only a portion of the colony or complex will be disturbed. If a field check indicates that prairie dog towns may be affected, you should contact this office for guidance on ferret surveys.

Bald eagle
Bald eagles are known to nest near the project area, in the vicinity of the Little Snake River. The Service recommends the project area be surveyed for nesting eagles and roost areas. If any active nests or roost areas are identified within 1 mile of the proposed project, we recommend avoiding work in the area between February 15 and August 15 (nesting), and November 15 and March 15 (winter roosting) to avoid impacts to any nests and roost areas. If timing and/or location of the work cannot be modified to avoid possible impacts you should contact this office to discuss consultation requirements pursuant to the Act.

Mountain plover
In the Federal Register dated February 16, 1999, the U.S. Fish and Wildlife Service (Service) gave notice of a proposal to list the mountain plover as a threatened species pursuant to the Act. A final listing decision is expected in the near future. The mountain plover is a small bird associated with shortgrass prairie and shrub-steppe landscapes. Mountain plover breeding habitats are known to include grasslands, mixed grassland areas and short-grass prairie, shrub-steppe, plains, alkali flats, agricultural lands, cultivated lands, sod farms, and prairie dog towns. Plovers may nest on sites where vegetation is sparse or absent, or near closely cropped areas, manure piles or rocky areas. Mountain plovers are rarely found near water and show a preference for previously disturbed areas or modified habitat. We have information that the mountain plover or its habitat occurs near the project area. If the mountain plover is listed prior to the completion of your project, unnecessary delays may be avoided by considering project impacts to this species now.

Ute ladies'-tresses
Ute ladies'-tresses is a perennial, terrestrial orchid, endemic to moist soils near wetland meadows, springs, lakes, and perennial streams. It occurs generally in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows at elevations from 4,200 to 7,000 feet. The orchid colonizes early successional riparian habitats such as point bars, sand bars, and low lying gravelly, sandy, or cobbly edges, persisting in those areas where the hydrology provides continual dampness in the root zone through the growing season. Recent discoveries of orchid colonies in Wyoming and Montana indicate that surveys for and inventories of orchid occurrences continue to be an important part of orchid recovery planning and implementation.

Canada lynx
In Wyoming, the lynx lives in subalpine/coniferous forests of mixed age and structural classes. Mature forests with downed logs and windfalls provide cover for denning sites, escape, and

protection from severe weather. Early successional forest stages provide habitat for the lynx's primary prey, the snowshoe hare. The home range of a lynx can be 5 to 94 square miles. They are capable of moving extremely long distances in search of food. Lynx are highly dependent on snowshoe hare, but when hare populations drop they also prey on other small mammals and birds. The U.S. Fish and Wildlife Service (Service) published a final rule in the Federal Register on March 24, 2000, listing the North American lynx population in the contiguous United States as threatened, pursuant to the Endangered Species Act. The Service identified that significant threats to the lynx were (1) loss and/or modification of habitat; (2) past commercial harvest (trapping), which is partially responsible for the extremely small lynx population; (3) inadequate regulatory mechanisms to protect lynx and their habitat; and (4) other factors such as increased human access into suitable habitat and human-induced changes in habitat allowing other species (e.g., bobcats and coyotes) to move into lynx habitat and compete with them.

Federal agencies are also encouraged to consider sensitive species or species at risk in project review. Your consideration of these species is important in preventing their inclusion on the Endangered Species List. The Wyoming Natural Diversity Database maintains the most current information on sensitive plants in Wyoming.

Colorado River water depletions
If the proposed action will lead to water depletion (consumption) in the Colorado River System, impacts to the following species should be included in the evaluation:

Bonytail (*Gila elegans*)	Endangered	Downstream resident of Green River System.
Colorado pikeminnow (*Ptychocheilus lucius*)	Endangered	" "
Humpback chub (*Gila cypha*)	Endangered	" "
Razorback sucker (*Xyrauchen texanus*)	Endangered	" "

Please keep this office informed of any decisions or developments concerning this project. If you have any further questions please contact Audrey Taylor of my staff at the letterhead address or phone (307) 772-2374, extension 37.

cc: Statewide Habitat Protection, WGFD, Cheyenne, WY

APPENDIX G

WILDLIFE RESOURCES:

Locations and Types of Wildlife Resources within the DFPA

APPENDIX G: WILDLIFE RESOURCES

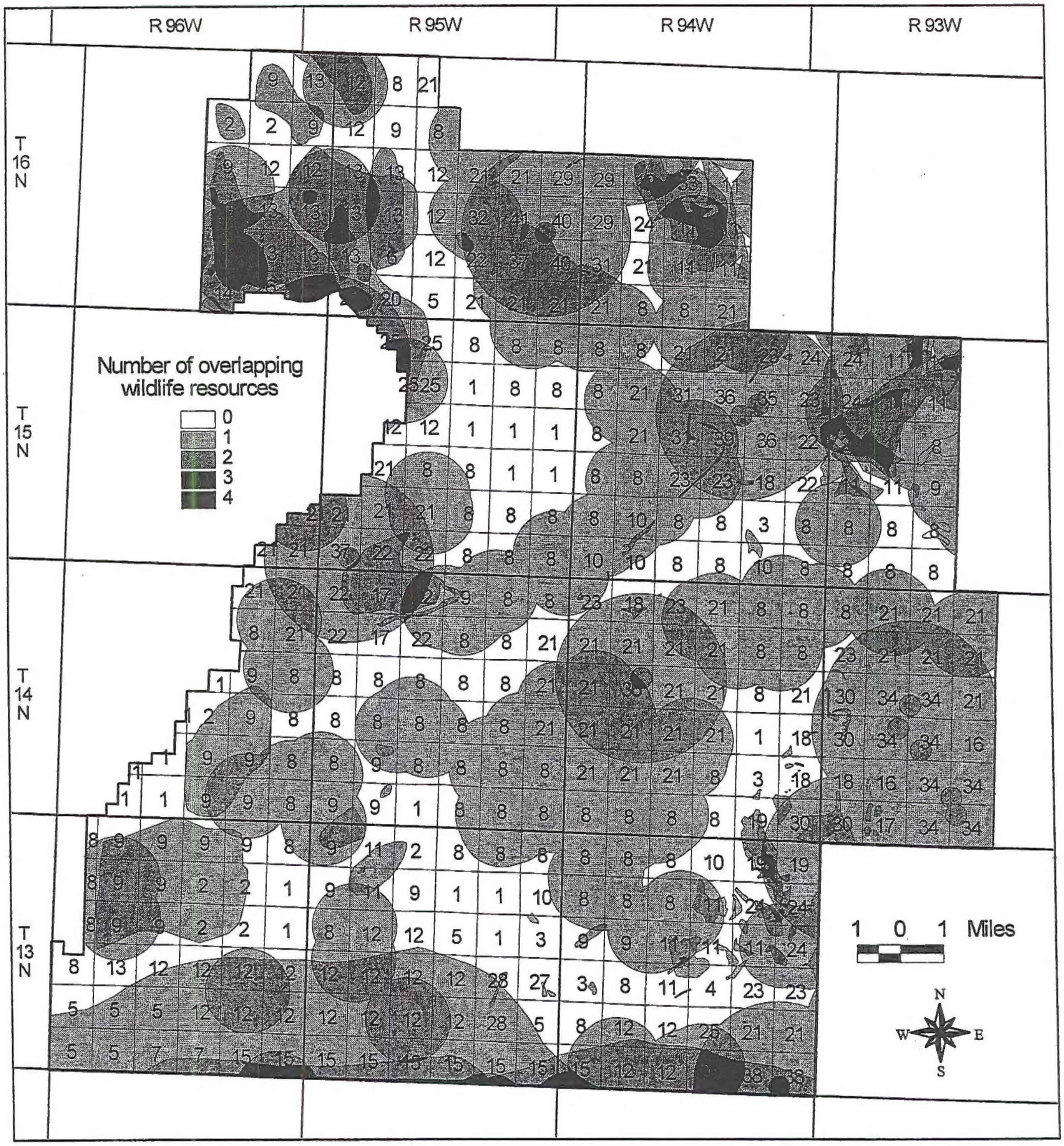

Figure G-1. Locations and types of wildlife resources that could potentially be impacted within each section of the DFPA. Numbers in sections are resource codes listed in Table G-1 and describe the combinations of wildlife resources present. The physical distribution and overlap of wildlife resources is depicted by levels of shading. Wildlife resource include: big game (elk, mule deer, pronghorn) crucial winter range; greater sage grouse leks (1/4 mi. buffer), nesting habitat (2-mile buffer around leks), and severe winter relief habitat; potential mountain plover habitat; raptor nest 1-mile buffers; and prairie dog colonies.

APPENDIX G: WILDLIFE RESOURCES

Table G-1. Wildlife Resource Code Definitions. Potential resources included in this summary are: Big game crucial winter range habitat, overlapping big game crucial winter range, prairie dog colonies, potential mountain plover habitat, raptor nests, sage grouse leks (1/4 mi. buffer), sage grouse nesting habitat (2-mile lek buffer), and sage grouse severe winter relief habitat.

Resource Code	Definition of code	Number of Resources	Number of Sections
1	None of the resources present	0	19
2	Mountain plover habitat	1	8
3	Prairie Dog colony	1	4
4	Mountain plover habitat and prairie dog colony	2	1
5	Big game CWR only	1	8
6	Big game CWR, prairie dog colony, and mountain plover habitat	3	1
7	Overlapping big game CWR	1	2
8	Raptor nest	1	92
9	Raptor nest and mountain plover habitat	2	28
10	Raptor nest and prairie dog colony	2	6
11	Raptor nest, prairie dog colony, and mountain plover habitat	3	19
12	Raptor nest and big game CWR	2	30
13	Raptor nest, big game CWR and mountain plover habitat	3	11
14	Raptor nest, big game CWR, mountain plover habitat, and prairie dog colony	4	3
15	Raptor nest and overlapping big game CWR	2	9
16	Sage grouse nesting	1	2
17	Sage grouse nesting and mountain plover habitat	2	3
18	Sage grouse nesting and prairie dog colony	2	5
19	Sage grouse nesting, prairie dog colony, and mountain plover habitat	3	4
20	Sage grouse nesting, big game CWR, and mountain plover habitat	3	3
21	Sage grouse nesting and raptor nest	2	51
22	Sage grouse nesting, raptor nest, and mountain plover habitat	3	9
23	Sage grouse nesting, raptor nest, and prairie dog colony	3	9
24	Sage grouse nesting, raptor nest, mountain plover habitat, and prairie dog colony	4	8
25	Sage grouse nesting, raptor nest, and big game CWR	3	6
26	Sage grouse nesting, raptor nest, big game CWR, and mountain plover habitat	4	1
27	Sage grouse SWR habitat	1	1
28	Sage grouse SWR and big game CWR	2	2
29	Sage grouse SWR and nesting	2	3
30	Sage grouse SWR and nesting and prairie dog colony	3	4
31	Sage grouse SWR and nesting and raptor nest	3	3
32	Sage grouse SWR and nesting, raptor nest, and mountain plover habitat	4	1
33	Sage grouse SWR and nesting, raptor nest, mountain plover habitat, and prairie dog colony	5	1
34	Sage grouse lek and nesting	2	8
35	Sage grouse lek and nesting and prairie dog colony	3	1
36	Sage grouse lek and nesting and raptor nest	3	3
37	Sage grouse lek and nesting, raptor nest, and mountain plover	4	2
38	Sage grouse lek and nesting, raptor nest, and big game CWR	4	2
39	Sage grouse SWR, lek, and nesting, and prairie dog colony	4	1
40	Sage grouse SWR, lek and nesting and raptor nest	4	2
41	Sage grouse SWR, lek, and nesting, raptor nest, and mountain plover habitat	5	1

CWR = Crucial Winter Range
SWR = Severe Winter Relief Habitat

Table G-2. Wildlife resources present within each section of the DFPA. Resource code definitions are listed in Table G-1.

Township	Section	Resource Code[a]
T16N R96W	1	13
	2	9
	10	2
	11	2
	12	9
	13	12
	14	12
	15	9
	22	14
	23	13
	24	13
	25	13
	26	13
	27	14
	34	14
	35	26
	36	20
T16N R95W	4	21
	5	8
	6	12
	7	12
	8	9
	9	8
	13	29
	14	21
	15	21
	16	12
	17	13
	18	13
	19	13
	20	13
	21	12
	22	32
	23	41
	24	40
	25	40
	26	37
	27	22
	28	12
	29	6
	30	13
	31	20
	32	20
	33	5
	34	21
	35	21
	36	21
T16N R94W	15	11
	16	33
	17	19
	18	29
	19	29
	20	24
	21	11
	22	11
	27	11
	28	11
	29	21
	30	31
	31	21
	32	8
	33	8
	34	21
T15N R96W	25	21
	35	21
	36	21
T15N R95W	1	8
	2	8
	3	8
	4	25
	5	25
	8	25
	9	25
	10	1
	11	8
	12	8
	13	1
	14	1
	15	1
	16	12
	17	12
	20	21
	21	8
	22	8
	23	1
	24	1
	25	8
	26	8
	27	8
	28	21
	29	21
	30	21
	31	37
	32	22
	33	22
	34	8
	35	8
	36	8

Table G-2. Continued.

Township	Section	Resource Code[a]
T15N R94W	1	24
	2	23
	3	21
	4	21
	5	8
	6	8
	7	8
	8	21
	9	31
	10	36
	11	35
	12	23
	13	22
	14	36
	15	39
	16	31
	17	21
	18	8
	19	8
	20	8
	21	23
	22	23
	23	18
	24	22
	25	8
	26	3
	27	8
	28	8
	29	10
	30	8
	31	10
	32	10
	33	8
	34	8
	35	10
	36	8
T15N R93W	4	11
	5	11
	6	24
	7	24
	8	11
	9	11
	16	8
	17	11
	18	24
	19	11
	20	11
	21	9
	28	8
	29	8
	30	8
	31	8
	32	8
	33	8
T14N R96W	1	21
	2	21
	11	8
	12	21
	13	8
	14	9
	15	1
	21	1
	22	2
	23	9
	24	8
	25	8
	26	9
	27	9
	28	1
	29	1
	32	1
	33	1
	34	9
	35	9
	36	8
T14N R95W	1	8
	2	8
	3	9
	4	22
	5	17
	6	22
	7	22
	8	17
	9	22
	10	8
	11	8
	12	21
	13	21
	14	8
	15	8
	16	8
	17	8
	18	8
	19	8
	20	8
	21	8
	22	8
	23	8
	24	21
	25	8
	26	8
	27	8
	28	8
	29	9
	30	8
	31	9
	32	9
	33	1
	34	8
	35	8
	36	8

Table G-2. Continued.

Township	Section	Resource Code[a]	Township	Section	Resource Code[a]	Township	Section	Resource Code[a]
T14N R94W	1	8	T14N R93W	3	21	T13N R96W	1	8
	2	8		4	21		2	9
	3	21		5	21		3	9
	4	23		6	8		4	9
	5	18		7	23		5	9
	6	23		8	21		6	8
	7	21		9	21		7	8
	8	21		10	21		8	9
	9	21		15	21		9	9
	10	21		16	34		10	2
	11	8		17	34		11	2
	12	8		18	30		12	1
	13	21		19	30		13	1
	14	8		20	34		14	2
	15	21		21	34		15	2
	16	21		22	16		16	9
	17	36		27	34		17	9
	18	21		28	34		18	8
	19	21		29	16		19	8
	20	21		30	18		20	13
	21	21		31	30		21	12
	22	21		32	17		22	12
	23	1		33	34		23	12
	24	18		34	34		24	12
	25	18					25	12
	26	3					26	12
	27	8					27	12
	28	21					28	5
	29	21					29	5
	30	21					30	5
	31	8					31	5
	32	8					32	5
	33	8					33	7
	34	8					34	7
	35	19					35	15
	36	30					36	15

Table G-2. Continued.

Township	Section	Resource Code[a]	Township	Section	Resource Code[a]
T13N R95W	1	8	T13N R94W	1	19
	2	8		2	19
	3	8		3	10
	4	2		4	8
	5	11		5	8
	6	9		6	8
	7	9		7	8
	8	11		8	8
	9	9		9	8
	10	1		10	11
	11	1		11	24
	12	10		12	24
	13	3		13	24
	14	1		14	11
	15	5		15	11
	16	12		16	11
	17	12		17	9
	18	8		18	9
	19	12		19	3
	20	12		20	8
	21	12		21	11
	22	12		22	4
	23	28		23	23
	24	27		24	23
	25	5		25	21
	26	28		26	21
	27	12		27	25
	28	12		28	12
	29	12		29	12
	30	12		30	8
	31	15		31	15
	32	15		32	12
	33	15		33	12
	34	15		34	25
	35	15		35	38
	36	15		36	38

APPENDIX H

WILDLIFE MONITORING/PROTECTION PLAN

APPENDIX H

WILDLIFE MONITORING/PROTECTION PLAN

DESOLATION FLATS NATURAL GAS DEVELOPMENT PROJECT

Prepared for:

U.S. Bureau of Land Management
Rawlins Field Office
Rawlins, Wyoming

and

U.S. Bureau of Land Management
Rock Springs Field Office
Rock Springs, Wyoming

By:

Mary Read, BLM-RFO Wildlife Biologist
DFPA Review Team

APPENDIX H

WILDLIFE MONITORING/PROTECTION PLAN

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ABBREVIATIONS AND ACRONYMS

ANS	Artificial Nesting Structure
APD	Application for Permit to Drill
APLIC	Avian Powerline Interaction Committee
BA	Biological Assessment
BLM	Bureau of Land Management
BO	Biological Opinion
CSU	Controlled Surface Use
DFPA	Desolation Flats Project Area
EIS	Environmental Impact Statement
GIS	Geographic Information System
LOP	Life-of-Project
RFO	Rawlins Field Office
ROW	Right-of-Way
RSFO	Rock Springs Field Office
TEP&C	Threatened, Endangered, Proposed, and Candidate Species
USFWS	U.S. Fish and Wildlife Service
WGFD	Wyoming Game and Fish Department
WYNDD	Wyoming Natural Diversity Database

APPENDIX H: WILDLIFE MONITORING PLAN

1.0 INTRODUCTION

The Wildlife Monitoring/Protection Plan was prepared in conjunction with the Environmental Impact Statement (EIS) for the Desolation Flats Natural Gas Development Project, Sweetwater and Carbon counties, Wyoming. The goal of the plan is to avoid and/or minimize adverse impacts to wildlife that may be present on project-affected areas by monitoring and protecting wildlife populations and associated habitat on the Desolation Flats Project Area (DFPA) during the course of project development and operations and by developing appropriate mitigative actions. Implementation of the plan will allow managers and project personnel opportunities to achieve and maintain desired levels of wildlife productivity and populations on the DFPA (e.g., at pre-project levels) by minimizing and/or avoiding potential adverse impacts to wildlife species. In addition, the implementation of this plan will facilitate the maintenance of a diverse assemblage of wildlife populations on the DFPA simultaneously with the development of natural gas reserves. A Review Team (Review Team), comprised of personnel from the U.S. Bureau of Land Management (BLM) Rawlins Field Office (RFO) and Rock Springs Field Office (RSFO), the U.S. Fish and Wildlife Service (USFWS), the Wyoming Game and Fish Department (WGFD), and Industry (Operators), has been identified to determine wildlife monitoring and protection requirements and needs on an annual basis within the DFPA (USDI-BLM 2000).

The Proposed Action for the Desolation Flats Natural Gas Development Project involves the development of a maximum of 385 new wells at 361 well locations and associated facilities (roads, pipelines, compressor stations) on the DFPA over the next 15-20 years. The proposed life-of-project (LOP) is estimated to be from 30 to 50 years. Alternative development strategies also have been proposed (i.e., Increased Development Alternative, No Action Alternative). A complete description of the proposed project and alternatives is provided in Chapter 2.0 of the EIS.

Proposed inventory, monitoring, and protection measures will be implemented under each potential development scenario (i.e., alternative), unless information revealed in the coordinated review of annual wildlife reports (see Section 2.1) indicates these measures are unnecessary for wildlife protection. The wildlife monitoring / protection plan will not be implemented under the No Action Alternative.

Implementation of the plan will begin in 2003, and it is estimated that the implementation will continue for a maximum of 20 years; however, the plan may be terminated at the end of any year when there is sufficient evidence that wildlife populations and productivity in the DFPA have been successfully protected. The plan will receive a major review for effectiveness every five to six years, or as determined by the Review Team.

2.0 IMPLEMENTATION PROTOCOL

This section provides a preliminary wildlife inventory, monitoring, and protection protocol for the DFPA. A summary of primary protocol components is provided in Table H-1. Inventory and monitoring requirements are included in this table. In areas where development may reach 4 well locations per section, then additional inventory, monitoring, and protection measures are provided, unless otherwise agreed to by the Review Team, and are located in Table H-2. Standard protocol for Application for Permit to Drill (APD) and right-of-way (ROW) application field reviews are provided in Table H-5. Alternative protocols likely will be developed in the future in response to

specific needs identified in annual wildlife reports (see Section 2.1). Methods are provided for each wildlife species and/or category, and additional species and/or categories may be added based on needs identified in annual wildlife reports. The wildlife species and/or categories for which specific inventory, monitoring, and protection procedures will be applied were developed based on management agency (i.e., RFO and RSFO, USFWS, and WGFD) and individual concerns identified during the preparation of the EIS.

Considerable efforts will be required by agency and Operator (e.g., Marathon, EOG, Tom Brown, Questar, etc.) personnel for plan implementation. Many of the annually proposed agency data collection activities are consistent with current agency activities. Additionally, during annual planning and throughout project implementation, all efforts will be made to accommodate agency personnel schedules and responsibilities, and further agency cost-sharing approaches will be considered such that public demands and statutory directives are achieved (USDI-BLM 2000).

2.1 ANNUAL REPORTS AND MEETINGS

During project development (i.e., 15-20 years), Operators will provide an updated inventory and description of all existing project features (i.e., locations, size, and associated human activity at each feature), as well as those tentatively proposed for development during the next 12 months. This inventory will be submitted to the BLM by the Operators no later than October 15 of each year. These data will be coupled with annual wildlife inventory, monitoring, and protection data obtained from the previous year and included in annual reports. Annual reports will be prepared by the BLM. When annual wildlife inventory, monitoring, and protection data are gathered by parties other than the BLM, those parties (e.g., Operators, WGFD) will be requested to provide the data to the BLM by October 15 of each year. Upon receipt of these data, annual reports will be completed in draft form by the BLM and submitted to Operators, USFWS, and other interested parties no later than December 15 of each year. A one-day meeting of the Review Team will be organized by the BLM and held in January/February of the following year to discuss and modify, as necessary, proposed wildlife inventory, monitoring, and protection protocol for the subsequent field season.

Decisions regarding annual Operator-specific financing and personnel requirements will be made at these meetings. A protocol regarding how to accommodate previously unidentified development sites will also be determined during the annual meeting. Final decisions will be made by the BLM based on the input from the Review Team and all affected parties.

A final annual report will be issued by the BLM to all potentially affected individuals and groups by February/March of each year. Annual reports will summarize annual wildlife inventory and monitoring results, note any trends across years (if available), identify and assess protection measures implemented during past years, specify monitoring and protection measures proposed for the upcoming year, and recommend modifications to the existing wildlife monitoring/protection plan based on the success, and/or failures of past years (e.g., identification of additional species and/or categories to be monitored).

Where possible, the data presented in reports will be used to identify potential correlations between development and wildlife productivity and/or abundance. Addendum H-1 provides examples for the tabular presentation of data within annual reports; however, it should be noted that the final report format will be determined by the BLM. The BLM's Geographic Information System (GIS) will

APPENDIX H: WILDLIFE MONITORING PLAN

Table H-1: *Summary of General Wildlife Reporting, Inventory, and Monitoring, Desolation Flats Natural Gas Development Project Sweetwater and Carbon Counties, Wyoming, 2002.*

REPORTING		
Action	***Dates***	***Responsible Entity***[1]
Annual area wide tentative plan of development showing locations of existing and newly proposed development features.	Annually by October 15.	Operators
Annual reports summarizing findings and presenting protection actions.	Annually by: Draft - December Review Team Meeting - January/February Final - February/March	BLM with reviews by Operators, USFWS, WGFD, and other interested parties.
Meetings to finalize future years' inventory, monitoring, and protection measures.	Early December/January and as necessary.	BLM with participation by USFWS, Operators, WGFD, and other interested parties.
INVENTORY AND MONITORING		
Action	***Dates***	***Responsible Entity***
Raptor nest inventories (DFPA plus one mile buffer).	Every 5 years during April-May.	BLM; Operator-provided financial assistance for aircraft rental.
Raptor productivity monitoring (on the DFPA plus a one-mile buffer).	Every 5 years during March to mid-July.	BLM with Operator-provided financial assistance for aircraft rental as necessary.
Aerial greater sage-grouse lek inventories (DFPA plus a two-mile buffer).	Every 5 years during March-April.	BLM; Operator-provide financial assistance for aircraft rental.
Greater sage-grouse lek attendance monitoring on and within two-miles of the DFPA.	Annually during March to mid-May.	Selected leks will be visited at least once by the BLM and/or WGFD, such that all known leks are visited every three years.
Greater sage-grouse winter habitat inventory and monitoring within and adjacent to the DFPA.	As required during December-February.	BLM, in coordination with WGFD; Operator-provided financial assistance for aircraft rental.
Big game crucial winter range use monitoring (crucial winter range on the DFPA plus a one-mile buffer, or as determined by the Review Team).	As required and/or available.	BLM, in coordination with WGFD; Operator-provided financial assistance for aircraft rental.

[1]With Operator assistance, it is anticipated that agency obligations will not greatly exceed currently approved personnel or financial commitments.

be used for information storage, retrieval, and planning, and annual GIS data updates will be conducted. Raw data collected each year also will be provided to other management agencies (e.g., WGFD, USFWS, Wyoming Natural Diversity Database[WYNDD]) at the request of those

agencies. In addition, sources of potential disturbance to wildlife will be identified, where practical (e.g., development activities, weather conditions, etc.).

Additional reports may be prepared in any year, as necessary, to comply with other relevant wildlife laws, rules, and regulations (e.g., black-footed ferret survey reports, raptor reports).

Additional meetings will be held as necessary in any given year by the BLM, Operators, and/or USFWS in Rawlins to inform and update Operator personnel on the findings of the annual reports (USDI-BLM 2000).

2.2 ANNUAL INVENTORY AND MONITORING

The inventory and monitoring protocol will be as identified below for each wildlife species and/or category. This protocol will be unchanged across development alternatives, except as authorized by the BLM or specified in this plan. Additional wildlife species and/or categories and associated surveys may be added or omitted in future years, pending the coordinated review of annual wildlife reports. Opportunistic wildlife observations may be made throughout the year by agency and Operator personnel present in the DFPA.

The frequency of inventory and monitoring will be dependent upon the level of development in the DFPA (see Tables H-1 and H-2). In general, inventory and monitoring frequency will increase with increased levels of development. Inventory and monitoring results may identify the need for further scientific studies. The Review Team and/or BLM will identify the level of effort required by this wildlife plan, subject to the standards stated in the following paragraphs. Site- and species-specific surveys will continue to be conducted in association with APD and ROW application field reviews (see Table H-5).

2.2.1 Raptors

Raptor inventories of potentially affected areas were conducted in early May 2000 and will continue to be conducted every five years thereafter for the LOP to determine the location of raptor nests/territories and their activity status by the BLM (Table H-1). At this time, no raptor concentration areas are known to exist. Approximate raptor nest locations on and adjacent to the DFPA have been identified and are presented in the Wildlife and Fisheries Technical Report for the Desolation Flats Natural Gas Development Project (HWA 2002). These surveys may be implemented aerially (e.g. via helicopter) or from the ground with operator-provided financial assistance. Data collected during surveys will be recorded on Raptor Nesting Record, Raptor Observation Data Sheets, or other similar data forms (Addendum H-1).

Nest productivity monitoring will be conducted by the BLM at active nests that are located within the project area (DFPA plus one-mile buffer) every five years. Nest productivity monitoring will occur between March 1 and mid-July to determine nesting success (i.e., number of nestlings/fledglings). These surveys generally will be conducted from the ground, and attempts will be made to determine the cause of any documented nest failure. Operators may provide financial assistance for aircraft rental, as necessary.

Additional raptor nest activity and productivity monitoring measures will be applied in areas with high levels of development (i.e., areas with ≥4 locations/section) on and within one mile of the DFPA (see Table H-2). Inventory and monitoring efforts in these areas, as well as selected undeveloped comparison areas, will be conducted annually during April and May, followed by nest productivity monitoring. Site- and species -specific raptor nest analyses will be conducted in association with all APD and ROW application field reviews (see Table H-5).

Table H-2: *Additional Wildlife Inventory and Monitoring Measures On and Adjacent to Areas with High Levels of Development (≥4 Locations/Section), Desolation Flats Project Area, Sweetwater and Carbon Counties, Wyoming, 2002.*

Action	*Dates*	*Responsible Entity*[1]
Raptor nest inventory/monitoring on areas with ≥4 locations/section plus a one-mile buffer and selected undeveloped comparison areas.	Annually during April and May.	BLM surveyor with Operator-provided financial assistance for aircraft rental.
Raptor productivity monitoring on areas with ≥4 locations/section plus a one-mile buffer and selected undeveloped comparison areas.	Annually during March-July.	BLM surveyor with Operator-provided financial assistance for BLM seasonal support.
Selected sensitive species inventory/monitoring on suitable habitats in areas with ≥4 locations/section plus a one-mile buffer and selected undeveloped comparison areas.	Annually during spring and summer.	BLM, Operators in coordination with USFWS; Operator-provided financial assistance, not to exceed $5,000 per operator in any given year.
Aerial greater sage-grouse lek inventory on areas with ≥4 locations/section plus a two-mile buffer and selected undeveloped comparison areas.	Annually during March-April.	BLM surveyor with operator-provided financial assistance for aircraft rental.
Greater sage-grouse lek attendance monitoring on areas with ≥4 locations/section plus a two-mile buffer and selected undeveloped comparison areas.	Annually during March to mid-May.	Each known lek will be visited at least once annually by the BLM and/or WGFD; subsequent visits will occur in BLM/WGFD-selected leks by the BLM in coordination with the WGFD.
Greater sage-grouse winter habitat inventory and monitoring in areas with ≥4 locations/section and undeveloped comparison areas.	Available years.	BLM surveyor in coordination with the WGFD; Operator-provided financial assistance.
Other studies on areas with ≥4 locations/section and selected undeveloped comparison areas.	Year-long and in any year as deemed necessary by BLM and/or USFWS.	BLM in coordination with USFWS and WGFD; Operator-provided financial assistance, not to exceed $5,000 per Operator in any given year.

[1]With Operator assistance, it is anticipated that agency obligations will not greatly exceed currently approved personnel or financial commitments.

All raptor nest/productivity surveys will be conducted using procedures that minimize potential adverse effects to nesting raptors. Specific survey measures for reducing detrimental effects are listed in Grier and Fyfe (1987) and Call (1978) and include the following:

(1) Nest visits will be delayed for as long as possible in the nesting season.
(2) Nests will be approached cautiously, and their status (i.e., number of nestlings/fledglings) will be determined from a distance with binoculars or a spotting scope.
(3) Nests will be approached tangentially and in an obvious manner to avoid startling adults.
(4) Nests will not be visited during adverse weather conditions (e.g., extreme cold, precipitation events, windy periods, hottest part of the day).
(5) Visits will be kept as brief as possible.
(6) All inventories will be coordinated by the BLM.
(7) The number of nest visits in any year will be kept to a minimum.
(8) All raptor nest location data will be considered confidential (USDI-BLM 2000).

These actions may reduce impacts to nesting raptors. It should be noted that the RFO, in coordination with the USFWS, monitors active/inactive raptor nests within the project area and may band raptors, specifically ferruginous hawks, during June and July. The RFO wildlife biologists have a USFWS permit to proceed with banding.

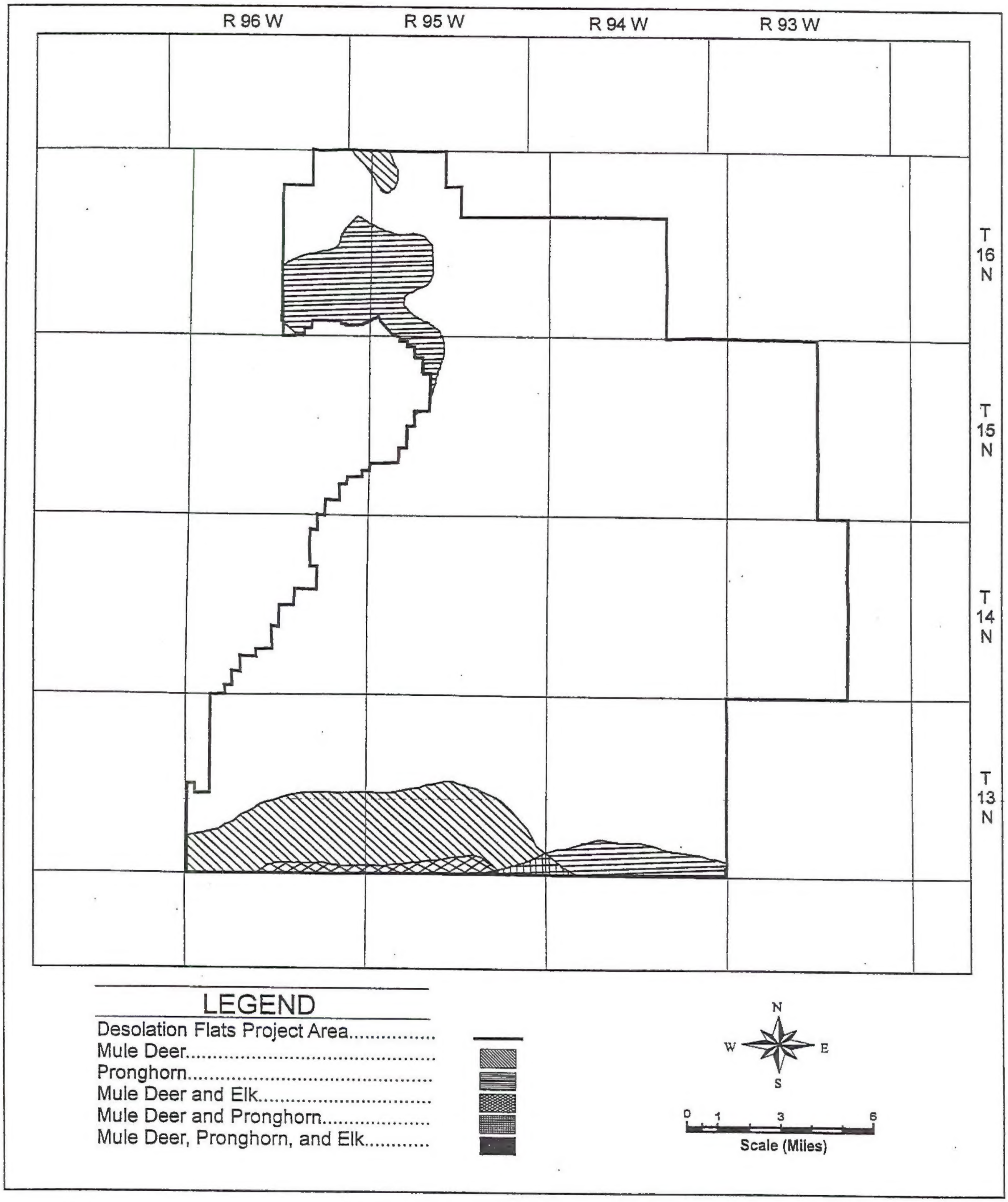
2.2.2 Big Game Species

To determine the need for application of crucial winter range seasonal stipulations and assess potential impacts to big game species occurring on the DFPA, data on big game use of crucial winter ranges on the DFPA and an adjacent one-mile buffer will be requested annually by the BLM from the WGFD, as deemed necessary by the BLM (see Table H-1). Big game crucial winter ranges are shown in Map H-1. If data indicates further study is needed, then the BLM will be responsible for the data collection, in coordination with the WGFD (USDI-BLM 2000).

Migration corridors and transitional ranges have been identified to some degree within and adjacent to the DFPA. There may be a need to identify these areas in more detail if impacts to big game movement are identified during these critical time periods. Big game migration corridors and transitional zones are broader in scope and may require additional studies/monitoring if the BLM, WGFD, and/or Review Team determine this need.

2.2.3 Threatened, Endangered, Proposed, and Candidate Species

The level of inventory and monitoring required for threatened, endangered, proposed, and candidate species (TEP&C) will be commensurate with established protocol for the potentially affected species. Survey protocol developed in conjunction with the Biological Assessment (BA) for this project will be conducted as a component of this wildlife protection plan. Methodologies and results of these surveys will be included in annual reports or provided in separate supplemental reports. A preliminary list of TEP&C species proposed for management and known to occur, or potentially to occur, in the vicinity of the DFPA is shown in Table H-3. As TEP&C species are added to or withdrawn from the USFWS list, appropriate modifications will be incorporated to this plan and specified in annual reports. Additional species of concern known to occur, or potentially occur, in the vicinity of the DFPA are shown in Table H-4 (BLM Wyoming State Sensitive Species).



Map H-1. Big game crucial winter ranges located within the Desolation Flats Project Area.

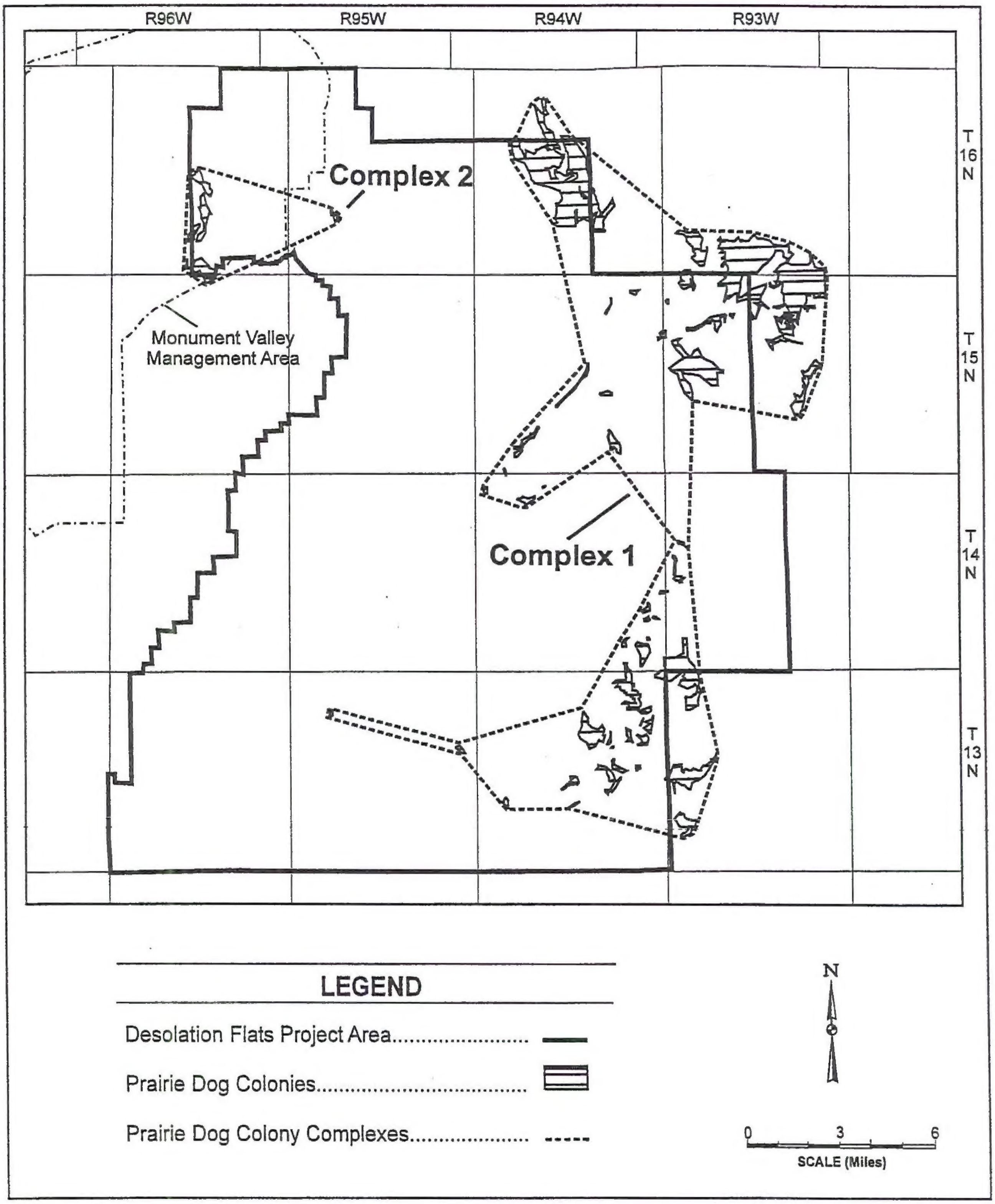
TEP&C species data collected during the surveys described below will be considered confidential and will be provided only as necessary to those requiring the data for specific management and/or project development needs. Site- and species-specific TEP&C species surveys will continue to be conducted as necessary in association with all APD and ROW application field reviews (see Table H-5). Data will be collected on appropriate General Wildlife Observation Data Sheets or similar forms (see Addendum H-1). Alternate/additional forms may be used as specified by the BLM (USDI-BLM 2000).

Table H-3: *Threatened, Endangered, Proposed, and Candidate Species Documented or Potentially Occurring on or in the Vicinity of the Desolation Flats Project Area, 2002.*

Species	Scientific Name	Status	Distribution
Bald Eagle	*Haliaeetus leucocephalus*	Threatened (proposed for de-listing)	Nesting, winter resident, migrant, statewide
Black-footed Ferret	*Mustela nigripes*	Endangered	Possible resident in prairie dog colonies
Canada Lynx	*Lynx Canadensis*	Threatened	Resident of forested areas, may travel through
Ute Ladies' Tresses	*Spiranthes diluvialis*	Threatened	Possible statewide, suitable habitat < 6,500 feet
Bonytail	*Gila elegans*	Endangered	Downstream resident of Green River
Colorado Pikeminnow	*Ptychocheilus lucius*	Endangered	Downstream resident of Green River
Humpback Chub	*Gila cypha*	Endangered	Downstream resident of Green River
Razorback Sucker	*Xyrauchen texanus*	Endangered	Downstream resident of Green River
Mountain Plover	*Charadrius montanus*	Proposed Threatened	Grasslands statewide
Yellow-billed Cuckoo	*Coccyzus americanus*	Candidate	Riparian areas west of the Continental Divide

2.2.3.1 Black-footed Ferret

BLM biologists will determine the presence/absence of prairie dog colonies at each proposed development site during APD and ROW application field revisions (see Table H-5). Prairie dog colonies (i.e., potential black-footed ferret habitat) on the area were mapped in April 2000 and burrow densities determined. White-tailed prairie dog colonies located on the DFPA are shown on Map H-2. Colonies that meet USFWS criteria as potential black-footed ferret habitat, per the USFWS 1989 Guidelines, will be surveyed for black-footed ferrets by either the BLM or USFWS-certified, Operator-financed, and BLM-approved biologist prior to BLM authorizing disturbance of these colonies. Surveys will only be conducted as deemed necessary during consultation between the BLM and USFWS. Black-footed ferret surveys will be conducted in accordance with the USFWS guidelines (USFWS 1989) and approved by the BLM and USFWS and will be conducted on a site-specific basis, depending on the areas proposed for disturbance in a given year as specified in the annual report.



Map H-2. Potential black-footed ferret habitat, (i.e. white-tailed prairie dog colonies and complexes) in relation to the Desolation Flats Project Area.

2.2.3.2 Bald Eagle

The inventory and monitoring protocol for the bald eagle will be as described for raptor species (Section 2.2.1).

2.2.3.3 Colorado Pikeminnow, Bonytail, Humpback Chub, and Razorback Sucker

There are four endangered fish species that inhabit areas within the Colorado River system. These four species are downstream residents of the Green River, located within the Colorado River system. If there are any proposed projects that will lead to water depletions (consumption) in the Colorado River system, then formal consultation with the USFWS will occur to reduce impacts to these species.

2.2.3.4 Mountain Plover

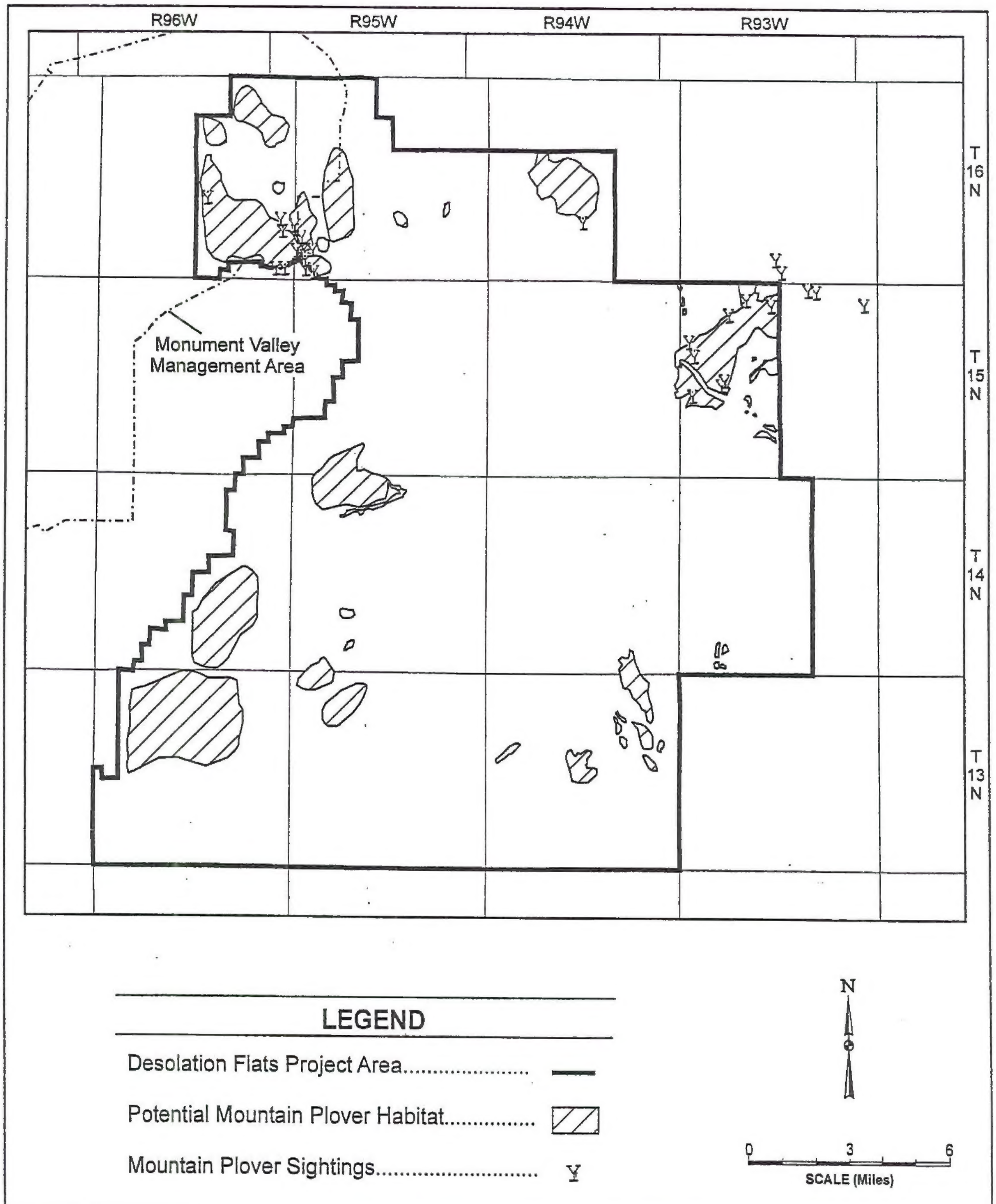
The Desolation Flats Project Area was mapped in June 2000 to determine if suitable mountain plover habitat existed (Map H-3). There was suitable habitat identified and individual projects will be assessed to determine if suitable mountain plover habitat (i.e., areas with flat topography and vegetation less than four inches high) exists within ¼-mile of each project site. Mountain plover surveys will be completed each field season to identify occupied habitat within the DFPA. Projects that are located in occupied mountain plover habitat, and include well pads, access roads, reserve pits, and ponds >40 acres in size, will have additional stipulations attached (see Addendum H-2). The Mountain Plover Survey Guidelines (USFWS 2002) will be followed for large scale/long term projects and short-term, linear projects. The guidelines identify surveys required to determine the presence and absence of mountain plover as well as density of nesting plovers. A copy of these guidelines will be attached to the Biological Assessment (BA).

2.2.3.5 Yellow-billed Cuckoo

The Yellow-billed cuckoo inhabits areas that contain open woodlands, stream-side willow, and alder groves. These birds are located west of the Continental Divide. There are not many riparian systems located within the DFPA; therefore, the chance of having these birds within the project area is minimal. Site-specific surveys will be conducted in association with all APD/ROW application field reviews.

2.2.4 BLM Wyoming State Director's Sensitive Species

Many wildlife and plant species are experiencing population declines; therefore, the Wyoming BLM has developed a sensitive species list to better manage these species and their habitats. The goal is to ensure that any actions on public lands consider the overall welfare of these species and do not contribute to their decline. The BLM policy on these species is implemented to ensure actions authorized, funded, or carried out by BLM do not contribute to the need for any species to become listed as a candidate, or for any candidate species to become listed as threatened or endangered. This list is meant to be dynamic, which means it could change as new information for species is accumulated (USDI-BLM 2001). The entire BLM Wyoming State Director's Sensitive Species list and BLM Instruction Memorandum No. WY-2001-040, dated April 9, 2001, are attached in Addendum H-3.



Map H-3. Areas identified as potential mountain plover habitat and mountain plover sightings on and proximal to the Desolation Flats Project Area.

Surveys for BLM Wyoming Sensitive Species (sensitive species) will be conducted by the BLM or a BLM-approved Operator-financed biologist in areas of potential habitat. Table H-4 describes the species that are considered sensitive species by the BLM and either are known to occur, or have the potential to occur, within the DFPA. The surveys for these species may be implemented in conjunction with surveys for other species or as components of the APD/ROW application.

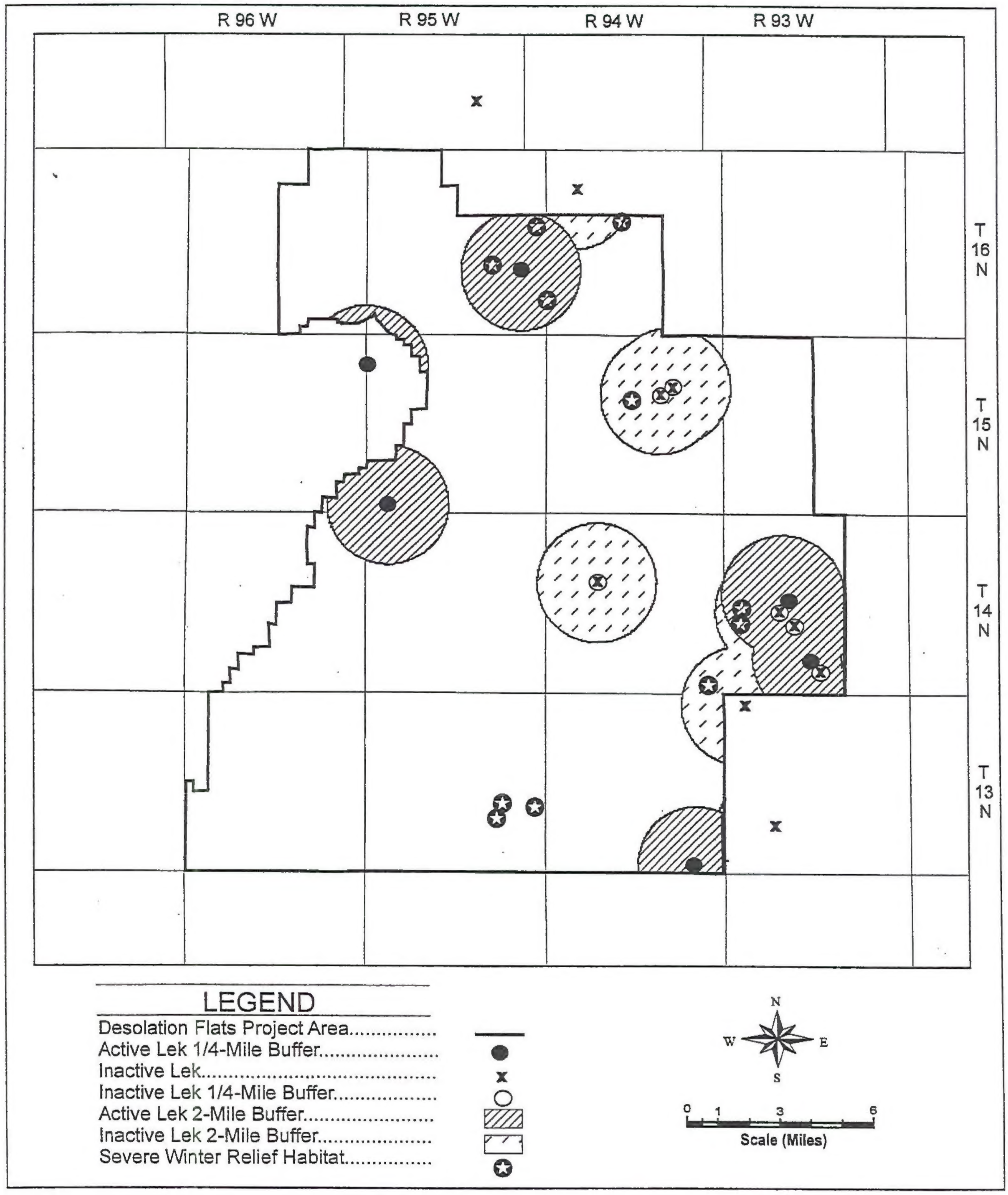
In addition, in areas where four well locations are developed (or in the case where more than four wells are drilled) the entire section plus a one mile buffer, as well as selected undeveloped comparison areas, will be surveyed annually during spring and summer by the BLM and/or BLM-approved Operator-financed biologists for selected sensitive species (see Table H-2). The Review Team may revise the distance of the survey area based on biological requirements and the number of surveys required for each species. If any sensitive species are observed, the observations will be noted on the appropriate data forms (see Addendum H-1). In addition, when and if sensitive species are observed, efforts will be made to determine their activities (e.g., breeding, nesting, foraging, hunting, etc.). If any management agency (e.g., BLM, USFWS) identifies a potential concern regarding any of these species, additional inventory and monitoring may be implemented as specified in annual reports (USDI-BLM 2000).

2.2.4.1 Greater Sage-grouse

Baseline data of greater sage-grouse lek locations, (both aerial and ground searches), were collected throughout the DFPA and 2-mile buffer in April of 2000 (Map H-4). In general, greater sage-grouse lek inventories will be conducted on the DFPA and a 2-mile buffer to determine lek locations every five years; however, the Review Team and/or BLM may recommend that monitoring may occur on an annual basis, or earlier than every five years (see Table H-1). Inventories will be conducted by the BLM during March and April every fifth year of this plan, or as deemed necessary by the Review Team. Surveys may be conducted aerially, which will include Operator-provided financial assistance for aircraft rental, or on the ground, as deemed appropriate by the BLM; aerial surveys will be used only to determine lek locations. In areas with four well locations per section, aerial inventories will be conducted annually on affected sections, a 2-mile buffer of disturbance areas, and selected undeveloped comparison areas (see Table H-2).

Selected leks within 2 miles of existing and proposed disturbance areas will be monitored annually by the BLM in coordination with the WGFD between March 1 and May 15, to determine lek attendance such that all leks on these areas are monitored at least once every three years (see Table H-1). Data collected during these surveys will be provided on Greater Sage-Grouse Lek Records or other suitable forms (see Addendum H-1) (USDI-BLM 2000). Map H-4 shows the greater sage-grouse leks that have been identified within the DFPA and a two-mile buffer; these leks include both known active and inactive leks.

Greater sage-grouse winter habitat surveys within the DFPA will be conducted when weather conditions permit to determine the use of these areas and/or any changes that may have occurred to this habitat within the project area (see Table H-1). Winter habitat surveys can only be completed during specific weather conditions, where there is adequate snow cover to determine actual winter use areas. In years when this snow cover is not available, then surveys should not be completed. Map H-4 shows known winter greater sage-grouse habitat that was identified during the 2001/2002 winter time period.



Map H-4. Greater sage-grouse leks, buffer zones, and severe winter relief habitats located within and near the Desolation Flats Project Area.

Table H-4: *BLM Wyoming State Director's Sensitive Species Documented or Potentially Occurring on or in the Vicinity of the Desolation Flats Project Area, 2002 (RFO = Rawlins Field Office, RSFO = Rock Springs Field Office).*

Species	*Scientific Name*	*RFO*	*RSFO*	*Habitat*
Birds				
Greater Sage-Grouse	*Centrocercus urophasianus*	X	X	Basin-prairie shrub, mountain foothill shrub
Peregrine Falcon	*Falco peregrinus*	X	X	Tall cliffs
Northern Goshawk	*Accipiter gentilis*	X	X	Conifer and deciduous forests
Ferruginous Hawk	*Buteo regalis*	X	X	Basin-prairie shrub, grassland, rock outcrops
Western Burrowing Owl	*Athene cunicularia*	X	X	Grasslands, basin-prairie shrub
Loggerhead Shrike	*Lanius ludovicianus*	X	X	Basin-prairie shrub, mountain-foothill shrub
Sage Thrasher	*Oreoscoptes montanus*	X	X	Basin-prairie shrub, mountain-foothill shrub
Sage Sparrow	*Amphispiza billineata*	X	X	Basin-prairie shrub, mountain-foothill shrub
Brewer's Sparrow	*Spizella breweri*	X	X	Basin-prairie shrub
Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	X		Grasslands
Mammals				
White-tailed Prairie Dog	*Cynomys leucurus*	X	X	Basin-prairie shrub, grasslands
Dwarf Shrew	*Sorex nanus*	X	X	Mountain foothill shrub, grasslands
Swift Fox	*Vulpes velox*	X	X	Grasslands
Pygmy Rabbit	*Brachylagus idahoensis*		X	Basin-prairie and riparian shrub
Wyoming Pocket Gopher	*Thomomys clusius*	X	X	Meadows with loose soil
Long-eared Myotis	*Myotis evotis*	X	X	Conifer and deciduous forests, caves and mines
Fringed Myotis	*Myotis thysanodes*	X	X	Conifer forests, woodland-chapparal, caves and mines
Townsend's Big-Eared Bat	*Corynorhinus townsendii*	X	X	Forests, basin-prairie shrub, caves and mines
Spotted Bat	*Euderma maculatum*		X	Cliffs over perennial water, basin-prairie shrub
Amphibians				
Northern Leopard Frog	*Rana pipiens*	X	X	Beaver ponds, permanent water in plains and foothills
Great Basin Spadefoot	*Spea intermontana*	X	X	Spring seeps, permanent and temporary waters

Table H-4: Continued.

Species	*Scientific Name*	*RFO*	*RSFO*	*Habitat*
Reptiles				
Midget Faded Rattlesnake	*Crotalus viridis concolor*		X	Mountain foothills shrub, rock outcrop
Fish				
Leatherside Chub	*Gila copei*		X	Bear, Snake, and Green River drainages, clear, cool, streams and pools
Roundtail Chub	*Gila robusta*	X	X	Colorado River drainage, mostly large rivers, also streams and lakes
Bluehead Sucker	*Catostomus discobolus*	X	X	Bear, Snake, and Green River drainages, all waters.
Flannelmouth Sucker	*Catostomus latipinnis*	X	X	Colorado River drainage, large rivers, streams, and lakes
Colorado River Cutthroat Trout	*Oncorhynchus clarki pleuriticus*	X	X	Colorado River drainage, clear mountain streams
Plants				
Nelson's Milkvetch	*Astragalus nelsonianus - or -stragalus pectinatus var. platyphyllus*	X	X	Alkaline clay flats, shale bluffs and gullies, pebbly slopes, and volcanic cinders in sparsely vegetated sagebrush, juniper, & cushion plant communities at 5,200-7,600
Wyoming Tansymustard	*Descurainia torulosa*		X	Sparsely vegetated sandy slopes at base of cliffs of volcanic breccia or sandstone 8,300-10,000
Large-fruited Bladderpod	*Lesquerella macrocarpa*		X	Gypsum-clay hills & benches, clay flats, & barren hills 7,200-7,700
Stemless Beardtongue	*Penstemon accaulis var. acaulis*		X	Cushion plant or Black sage grassland communities on semi-barren rocky ridges, knolls, & slopes at 5,900-8,200
Mystery Wormwood	*Artemisia biennis var. diffusa*		X	Clay flats and playas 6,500
Cedar Rim Thistle	*Cirsium aridum*	X	X	Barren, chalky hills, gravelly slopes, & fine textured, sandy-shaley draws, 6,700-7,200
Ownbe's Thistle	*Cirsium ownbeyi*		X	Sparsely vegetated shaley slopes in sage & juniper communities 6,440-8,400
Green River Greenthread	*Thelesperma caespitosum*		X	White shale slopes & ridges of Green River Formation 6,300
Uinta Greenthread	*Thelesperma pubescens*		X	Sparsely vegetated benches & ridges on coarse, cobbly soils of Bishop Conglomerate
Cedar Mountain Easter Daisy	*Townsendia microcephala*		X	Rocky slopes of Bishop Conglomerate
Gibben's Beardtongue	*Penstemon gibbensii*	X		Sparsely vegetated shale or sandy-clay slopes 5,500-7,700

2.2.4.2 Ferruginous Hawks, Peregrine Falcon, and Burrowing Owl

The inventory and monitoring protocol for these species is described in the raptor section (see Section 2.2.1).

2.2.5 Other Inventory and Monitoring Measures

Additional inventory and monitoring measures may be applied as specified in annual reports.

2.2.6 General Wildlife

BLM staff will be responsible for keeping records of selected wildlife species observed during the course of their activities on the DFPA and interested Operator personnel may also provide data on wildlife observations, and are encouraged to do so. The information provided will include observations of wildlife species, their numbers, location, activity, and other pertinent data as applicable and identified on the General Wildlife Observation Data Sheet presented in Addendum H-1 of this plan (USDI-BLM 2000).

2.3 PROTECTION MEASURES

The wildlife protection measures proposed herein have been developed from past measures identified for oil and gas developments in Wyoming (USDI-BLM 2000). Additional measures may be included and/or existing measures may be modified in any given year as allowable and as deemed appropriate by BLM in consultation with Operators and other interested parties, and these measures will be specified in annual reports. It is assumed that as the wildlife issues within the DFPA are further described and impacts identified, some protection measures will be removed, whereas others may be added. Protection measures will be implemented by Operators with assistance from and/or in consultation with the BLM. In addition, these measures may be modified on a site-specific basis as deemed appropriate by the BLM after completion of APD and ROW application field reviews.

The principle protection measures for most wildlife species will be avoidance of sensitive/crucial habitats (e.g. big game crucial winter range, raptor nests, greater sage-grouse leks, etc.), where possible. However, numerous species- and project-specific measures may be implemented. Additionally, general wildlife protection measures (see Table H-5) will likely benefit the majority of wildlife species found on and adjacent to the DFPA.

2.3.1 Raptors

The primary protection measure for raptor species on the DFPA will be avoidance of active/inactive nest locations during the breeding season. Active nests are defined as any raptor nest that has been used within the last three years. Depending on the timing of proposed construction and drilling activities, all surface-disturbing activities will be restricted from February 1 through July 31 within a 0.5 to 1.0 mile radius (depending upon species and site-specific conditions) of active, or occupied, as well as inactive, raptor nests and/or nesting territories (i.e., seasonal nest avoidance).

Exceptions to the timing stipulation may be made, based on field investigations of the nest at the time the exception was requested. In addition, well locations, roads, ancillary facilities, and other surface structures requiring a repeated human presence will not be constructed within 825 feet of active raptor nests, except ferruginous hawk, where the restriction will be 1,200 feet. The seasonal buffer distance and exclusion dates may vary, depending on factors, such as nest activity status, species, prey availability, natural topographic barriers, and line-of-sight distances. Actual nest buffers for each raptor nest will be established in annual reports.

Operators will notify the BLM immediately if raptors are found nesting on or within 1,200 feet of project facilities, and Operators will assist the BLM as necessary in erecting artificial nesting structures (ANS's), as appropriate. The use of ANS's will be considered as a last resort for raptor protection. If nest manipulation or a situation requiring a "taking" of a raptor nest becomes necessary, a special permit will be obtained from the Denver USFWS office, Permit Section. Permit acquisition will be coordinated with the USFWS Office in Cheyenne, Wyoming and will be initiated with sufficient lead time to allow for development of mitigation. Required corresponding permits will be obtained from the WGFD in Cheyenne. Consultation and coordination with the USFWS and the WGFD will be conducted for all protection activities relating to raptors.

If the Review Team determines that project activities could potentially affect raptor nesting on or adjacent to the DFPA as determined from decreased raptor productivity or nesting or documented nest abandonment or failure, ANS's may be constructed at a rate of one to two ANS's for one impacted nest, or existing degraded raptor nests may be upgraded/reinforced to minimize potential impacts. The BLM wildlife biologist will determine the number of required nests, up to two per project, based on site specific conditions and requirements. This focuses on the overall decline of raptor nesting success and will occur if the Review Team determines that projects may be the cause for this decline. The location, design, and other pertinent data regarding ANS's or nests proposed for upgrading will be identified in annual reports, and these ANS's will be located within the nesting territory of potentially affected raptor pairs and outside of the line-of-sight or nest buffer of actively nesting pairs, where possible. Operators will responsible for the annual maintenance of ANS's throughout the LOP. Annual ANS maintenance activities will be completed after August 1 and prior to October 15 each year, as necessary. ANS's will be placed within the nesting territories of potentially affected raptor pairs at sites sufficiently removed from development activities to minimize or avoid potential adverse effects. All ANS's on public lands will become the property of the BLM upon completion of the project.

In cases where existing project features (e.g., well locations) are located within the nest buffers of active raptor nests, no maintenance activities requiring a work-over rig, unless an exception has been approved, will be allowed during critical periods (i.e., approximately early March through mid-June). The exact dates of exclusion will be determined by the BLM and will likely vary between nests and from year to year, depending on the species present and variations in weather, nesting chronology, and other factors.

No above-ground power line construction is expected with the proposed project, however, if any power lines are built, construction will follow recommendations of the Avian Power Line Interaction committee (APLIC) (1994, 1996) and Olendorff et al. (1981) to avoid collision and/or electrocution of raptors.

Table H-5: *Summary of General APD/ROW Application Stage Survey/Protection Measures, Desolation Flats Project Area, Sweetwater and Carbon Counties, Wyoming, 2002.*

Protection Measure	Dates	Responsible Entity
APD-stage general raptor nest analysis within 0.75 to 1.0 mile of proposed disturbance.	Year-long	BLM, Operators
APD-stage seasonal raptor nest avoidance within 0.5 to 1.0 mile of active nests.	February 1-July 31 (depending on species and/or site-specific conditions)	Operators, BLM
APD-stage general raptor nest avoidance within 825 feet of active nests (1,200 feet for active ferruginous hawk nest).	Year-long (Controlled Surface Use [CSU]) generally excluding surface disturbance.	Operators, BLM
APD-stage sensitive species surveys (within 0.25 - 0.5 miles of proposed disturbance sites).	As necessary	*BLM or Operators*
APD-stage TE P& C habitat avoidance.	As necessary.	Operators, BLM
APD-stage prairie dog colony mapping and burrow density determination.	As necessary.	Operators, BLM
Black-footed ferret habitat (i.e., prairie dog colony) avoidance.	As necessary.	Operators, BLM
Black-footed ferret surveys where suitable habitat must be disturbed.	Where required, in appropriate season and no more than one-year prior to disturbance.	BLM, Operator-financed USFWS-approved biologist
APD-stage mountain plover surveys (within 0.25 mile of proposed project)	As necessary between April and July.	BLM, Operator-financed BLM-approved biologist
Mountain plover nest/brood avoidance.	April 10 - July 10	Operators, BLM
APD-stage western burrowing owl surveys (within 0.5 mile of proposed disturbance sites).	As necessary during June-August	BLM, Operator-financed BLM-approved biologist
Western burrowing owl nest avoidance.	As necessary.	Operators, BLM

Table H-5: Continued.

Protection Measure	Dates	Responsible Entity
APD-stage greater sage-grouse lek surveys on suitable habitats within 2.0 miles of proposed disturbance sites.	March 1 - mid-May.	Operators, BLM
APD-stage greater sage-grouse lek avoidance on areas within 2.0 miles of a lek.	March 1 - June 30.	Operators, BLM
APD-stage greater sage-grouse lek avoidance on areas within 0.25 mile of a lek.	Year-long.	Operators, BLM
APD-stage greater sage-grouse nest avoidance.	As necessary.	Operators, BLM
APD-stage greater sage-grouse winter habitat avoidance.	As necessary, in appropriate season December-February with adequate snow cover.	Operators, BLM
APD-stage general wildlife avoidance/protection	As necessary.	Operators, BLM, USFWS, WGFD
Big game crucial winter range avoidance.	November 15-April 30.	Operators, BLM

In the event that winter concentration habitat(s) are identified, then construction, drilling, and other activities disruptive to wintering raptors are prohibited during the period of November 15 to April 30 for the protection of winter concentration areas. At this point, winter concentration areas of bald eagles have not been identified; however, this stipulation will apply in the event that an area is identified (USDI-BLM 2000).

2.3.2 Big Game Species

No surface disturbing activities will occur within big game crucial winter range on the DFPA during critical winter periods (November 15 - April 30). No road or pipeline ROW fencing is proposed for the project; however, if ROW fencing is required, it will be kept to a minimum, and the fences will meet BLM/WGFD standards for facilitating wildlife movement. Wildlife proof fencing will be used only to enclose reclaimed areas where it is determined that wildlife species are impeding successful vegetation establishment. Snow-fences, if used, will be limited to segments of 0.25 mile or less. Project personnel will also be advised to minimize stopping and exiting their vehicles in big game winter habitat while there is snow on the ground. In addition, escape openings will be provided along roads in big game crucial winter ranges as designated by the BLM to facilitate exit of big game animals from snow-plowed roads. Additional habitat protection/improvement measures may

also be applied in any given year as directed by the BLM, in consultation with operators and other agencies, and specified in annual wildlife reports.

Increased human access within the DFPA may lead to increased poaching of big game animals. Potential increases in poaching may be reduced through employee and contractor awareness/education regarding wildlife laws. If violations are discovered on the DFPA Operators will immediately notify the WGFD, and if the violation is committed by an employee or contractor, said employee or contractor will be disciplined and may be dismissed by the Operator and/or prosecuted by the WGFD and/or USFWS (USDI-BLM 2000).

2.3.3 Threatened, Endangered, Proposed, and Candidate Species

USFWS consultation and coordination will be conducted for all protection activities relating to TEP&C species and their habitats, as needed. Where possible, these actions will be specified in advance in the annual reports. The terms and conditions of the Biological Opinion (BO) will be followed.

2.3.3.1 Black-footed Ferret

In general, all prairie dog colonies on the DFPA will be avoided, where practical. If prairie dog colonies of sufficient size and burrow density for black-footed ferrets are scheduled to be disturbed, then black-footed ferret surveys of those colonies will be conducted pursuant to BLM and/or USFWS decisions made during informal consultations. Survey protocol will adhere to USFWS guidelines as established by the USFWS (1989) in consultation with the BLM, and will be conducted by the BLM or a USFWS-qualified, BLM-approved biologist, a maximum of one year in advance of the proposed disturbance. Reports identifying survey methods and results will be prepared and submitted to the BLM in accordance with Section 7 of the Endangered Species Act of 1973, as amended, and the Interagency Cooperation Regulations. Surveys will be financed by Operators.

If black-footed ferrets are found on the DFPA, the BLM will be notified immediately and consultation with the USFWS will be initiated to develop strategies that ensure no adverse effects to the species occur. At this point, all activities will be stopped and before ground-disturbing activities are re-initiated in black-footed ferret habitat, authorization to proceed must be received from the BLM, in consultation with the USFWS (USDI-BLM 2000).

2.3.3.2 Bald Eagle

No surface disturbing activities are permitted between February 1 and July 31 within 1 mile of bald eagle nests (see section 2.3.1). Although there are not any identified bald eagle nests located within the DFPA, or a 1-mile buffer, the timing stipulation applies to all raptor nests and in the event that a bald eagle nest is identified in the project area, then it would be protected.

2.3.3.3 Colorado Pikeminnow, Bonytail, Humpback Chub, and Razorback Sucker

If any proposed development will lead to water depletions (consumption) in the Colorado River system, then formal consultation with the USFWS will occur to reduce impacts to these species.

2.3.3.4 Mountain Plover

Mountain plover habitats (e.g., cushion plant communities, playa lakes, flat areas with vegetation <4 inches in height) will be avoided where practical, and where these habitats will be disturbed, reclamation will utilize procedures designed to reestablish suitable plover habitat. No surface disturbing activities will be conducted within suitable mountain plover habitat on the DFPA during the breeding and nesting periods between April 10 and July 10. Additional protection measures listed in Addendum H-2 will be attached to individual APD's and ROW's, for those projects that include well pads, access roads, and reserve pits that occur in occupied habitat areas.

Exceptions to construct during the timing stipulation period may be granted provided that the *Mountain Plover Survey Guidelines U.S. Fish and Wildlife Service March 2002* are followed. If an active mountain plover nest is observed within survey areas, planned development activities will be delayed at least 37 days or one week post-hatching. If a brood of flightless chicks is discovered, planned activities will be delayed at least seven days.

2.3.3.5 Yellow-billed Cuckoo

There have not been any yellow-billed cuckoos inventoried and/or monitored within the DFPA at this time. The species basically inhabits riparian zones west of the Continental Divide, and, apart from Sand Creek during high flows, there are not any perennial streams located within the DFPA. It is highly unlikely that this species is present within this project area; however, if information shows that the birds may be present then the Review Team may make recommendations to the BLM, and/or the BLM may identify potential mitigation that may be required to protect this species. Standard operating procedures prohibit the construction of well sites, access roads, and pipelines within 500 feet of surface water and/or riparian areas. This would protect any existing yellow-billed cuckoo habitat.

2.3.4 BLM Wyoming State Director's Sensitive Species

The BLM's management authority for sensitive species is not as specifically structured as for proposed, listed, threatened, or endangered species. The management mandate is less regulatory, and more administrative and generic for sensitive species, than for proposed or listed species in the sense that the BLM is **NOT** required to:

1. Participate in the development of formal recovery plans or critical habitat designations for sensitive species, although the BLM can participate in conservation plans/agreements.

2. Enter into ESA Section 7 consultation in Federal actions, although the BLM can request technical assistance from the USFWS, or other entities.

3. Be concerned with the "take" provisions of biological opinions, or the prohibition of Section 9 of the ESA.

The BLM's posture toward management of sensitive species will be more collaborative and derived, and less directive than for proposed or listed species. The management of these species should be viewed as an opportunity to practice proactive conservation; however, the management of these

species should not be onerous or a "show-stopper' of other legitimate, multiple use activities (USDI-BLM, 2001).

If, during surveys of areas where proposed projects are identified, nests or other crucial habitat for any sensitive species identified in Table H-4 are found, avoidance of these features will be accomplished in consultation and coordination with the BLM and USFWS. Construction activities in these areas will be curtailed until there is concurrence between the BLM and USFWS on what activities can be authorized. Activities will, in most cases, will be delayed until such time that no adverse effects will occur (e.g., after fledging). It is assumed that the protocol specified for general wildlife will likely benefit sensitive species as well. If any agency (i.e., BLM, WGFD, USFWS) identifies a potential for impacts to any sensitive species, additional measures may be implemented as specified in annual reports.

2.3.4.1 Greater Sage-grouse

An NSO (no surface occupancy) restriction will apply within 0.25 miles of greater sage-grouse leks. In addition, powerlines will not be constructed within 0.6 miles of any lek, as necessary to protect leks from raptor predation. To protect nesting greater sage-grouse, operators will restrict construction activities between March 1 and June 30 within a two mile radius of an identified greater sage-grouse lek and associated nesting habitat. In addition, construction, drilling, and other activities potentially disruptive to wintering greater sage-grouse are prohibited during the period of November 15 to April 30 for the protection of winter concentration areas (USDI-BLM 2000).

2.3.4.2 Ferruginous Hawk, Peregrine Falcon, and Burrowing Owl

The protection protocol generally will be as described for raptors (see Section 2.3.1). Additional measures will be applied on a species- or site-specific basis, as deemed appropriate by the USFWS and/or BLM and specified in conditions of approval for individual APD's/ROW's. To protect nesting and brood rearing burrowing owls, construction, drilling, and other activities will be restricted between February 1 and July 31, or until young are fully fledged.

2.3.5 General Wildlife

Unless otherwise indicated, the following protection measures will be applied for all wildlife species. Additional measures primarily designed to minimize impacts to other DFPA resources (e.g., vegetation and surface water resources, including wetlands, steep slopes, etc.) are identified in the EIS and these measures may provide additional protection for area wildlife. Additional actions may be applied in any given year to further minimize potential impacts to wildlife. These actions will be specified in annual reports.

All roads on and adjacent to the DFPA that are required for the proposed project will be appropriately constructed, improved, maintained, and signed to minimize potential wildlife/vehicle collisions and facilitate wildlife (most notably big game) movement through the DFPA. Appropriate speed limits will be adhered to on all DFPA roads, and Operators will advise employees and contractors regarding these speed limits.

APPENDIX H: WILDLIFE MONITORING PLAN

To protect important habitat in areas with sagebrush greater than three feet tall, projects will be placed to avoid this habitat where possible. Additional non-species specific wildlife mitigation includes the following:

1. Reserve, work-over, and flare pits and other locations potentially hazardous to wildlife will be adequately protected by netting and/or fencing as directed by the BLM to prohibit wildlife access.

2. No surface water or shallow ground water in connection with surface water will be utilized for the proposed project.

3. If dead or injured raptors, big game, migratory birds, or unusual wildlife are observed on the DFPA, Operator personnel will contact the appropriate BLM and WGFD offices. Under no circumstances will dead or injured wildlife be approached or handled by Operator personnel.

4. Operators will implement policies designed to control poaching and littering and will notify all employees (contract and company) that conviction of a major violation could result in disciplinary action. Contractors will be informed that any intentional game law violation or littering within the DFPA could result in dismissal.

Additional project- and site-specific measures may be added in future years as specified in annual reports.

3.0 LITERATURE CITED

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ADDENDUM H-1

EXAMPLE DATA SUMMARY TABLES AND FORMS

RAPTOR NEST DESCRIPTION

DFPA

Species ______________________ **Nest ID** ______________________

Legal Location: T________N : R________W Sec________ _____ 1/4 of _____ 1/4 of _____1/4

GPS Coordinate: E______________ N__________________ (UTM NAD 27)

Nest:

Substrate ______________ Aspect of Substrate/Nest ______________

Height of Sustrate ______________ Height of Nest Above Ground ______________

Elevation ______________

Habitat Description/Comments ______________________________

USGS Quad

RAPTOR NEST DATA

DFPA

Nest No. ______________

Date	Observer	Species	Status	# Adults	# Eggs	# Young	# Fledged	Nest Condition	Comments

BIG GAME SURVEY

DFPA

Page _____ of _____

Date ______________ Observer _________________________ Survey Type: Aerial Ground

Weather: Temp. ____________ Wind ____________ %Cloud Cover ____________ %Snow Cover ____________

SPECIES	NUMBER (M/F)				LOCATION (T-R-Sec-1/4) / GPS Coord (UTM NAD 27)	HABITAT TYPE	ACTIVITY	COMMENTS
	Adult	Imm	Juv	Unk				

Summary of Observations of Threatened, Endangered, Candidate, and Other Species of Concern. (DFPA)

Year __________

Species	Total # Observed	Habitat Type(s)[1] MG	BS	DS	SB	JN	NVC	B/R	DIS	Comments

[1] MG = Mixed grass prairie
BS = Wyoming big sagebrush
DS = Desert shrub
SB = Saltbush
JN = Juniper
NVC = Non-vegetated channel
B/R = Basin exposed rock/soil
DIS = Disturbed

Black-Footed Ferret Survey Summary

DFPA

Project ______________________________

Survey Dates ____________ through ____________ Total Nights ______

Total Hours of Spotlight Search ______________

Total Acres Searched by Spotlight ______________

Total Colonies Searched by Spotlight ______________

Total Ferrets Observed ____________

Location of Ferret Sightings (include legal location and GPS coordinates)

____

____

Total Hours Searched in Daylight ______________

Total Acres Searched in Daylight ______________

Total Colonies Searched in Daylight ______________

Total Ferret Sign Observed and Location (include legal location and GPS coordinates)

____

____

Search Technique Description ______________________

____

____

____

____

____

____

____

____

Black-Footed Ferret Nocturnal Survey

DFPA

Project ______________________________ Survey No.______ of ______

Observers ______________________ Date ____________ 20______

Survey Method ______________________ Prairie Dog Town Number(s) ______________

Legal Location: Township__________N Range__________W Sec(s)________________

Prairie Dog Species __________________

		Start	End
Length of Survey Route (miles) ____________	Time	________	________
Area Searched (acres) ____________	Temperature	________	________
No. of Runs ________ Length of Run (hrs) ________	Wind	________	________
USGS Quad(s) ____________	% Cloud Cover	________	________

Ferret Observations: (Include detailed location/GPS coordinates for each)

Ferret Sighting ______________________________

Ferret Sign ______________________________

Sign Collected ______________________________

Unidentified Green Eye-Shine ______________________________

Photos Taken/Comments ______________________________

Potential Prey Species	Number Observed (circle each run)	Other Sign

Other Predator Species	Number Observed (circle each run)	Other Sign

Other Wildlife Species	Number Observed (circle each run)	Other Sign

Daylight Burrow Inspection: Time: __________ - __________ Area Searched (acres) __________

Location Searched ______________________ No. of Burrows Inspected: __________

Comments:

Mountain Plover Transect Field Form

DFPA

Route ID__________ Date__________ Tape Used?__________ Observer__________

Time Start __________ Temp Start (ºF)__________ Wind Start__________ %Cloud Cover Start__________

Time Stop__________ Temp Stop (ºF)__________ Wind Stop__________ %Cloud Cover Stop__________

Survey Point			Time	Plover Observation			Distance/ Bearing to Bird	Location of Bird/Nest		How Observed	Evidence of Breeding	Animal Activity	Habitat Type	Comments
ID	Easting	Northing		Adult	Juv	Nest		Easting	Northing					

SAGE GROUSE LEK DESCRIPTION

DFPA

Lek ID ______________________

Legal Location: T__________N : R__________W Sec__________ _____ 1/4 of _____ 1/4 of _____ 1/4

GPS Coordinate: E____________________ N________________________ (UTM NAD 27)

Site Description:

Habitat Type ______________________________ Slope ______________

Topography ______________________________ Elevation ______________

Comments ____

____

USGS Quad

SAGE GROUSE LEK DATA FORM

DFPA

Lek ID ______________________

Date	Time	Observer	Status	# Males	# Females	Survey Type	Weather Conditions	Comments

GENERAL WILDLIFE OBSERVATION FIELD FORM

DFPA

Observer ______________________ Year 20______

Date	SPECIES	NUMBER (M/F)				LOCATION (T-R-Sec-1/4)	HABITAT TYPE	ACTIVITY	COMMENTS
		Adult	Imm	Juv	Unk	GPS Coord (UTM NAD 27)			

ADDENDUM H-2

MOUNTAIN PLOVER ADDITIONAL STIPULATIONS

ADDENDUM H-2

Some of the following mountain plover protection measures may be implemented if mountain plover "occupied habitat areas" are disturbed:

1. To protect the identified mountain plover occupied habitat area, the proposed activity would not be allowed as proposed. An alternative such as moving the facility, directional drilling, piping and storage of condensate off the identified mountain plover occupied habitat area to a centralized facility, or other technique for the minimization of ground disturbance and habitat degradation would be required.

2. To protect the identified mountain plover occupied habitat area, the proposed facility would be moved ½ mile from the identified occupied habitat area.

3. To protect the identified mountain plover occupied habitat area and because mountain plover adults and broods may forage along roads during the night, traffic speed and traffic volume would be limited during night-time hours from April 10 to July 10.

4. Within ½ mile of the identified mountain plover occupied habitat area, speed limits would be posted at 25 mph on resource roads and 35 mph on local roads during the brood rearing period (June 1 - July 10).

5. The access road would be realigned to avoid the identified mountain plover occupied habitat area.

6. To protect the identified mountain plover occupied habitat area, traffic would be minimized from June 1 - July 10 by car-pooling and organizing work activities to minimize trips on roads within ½ mile of the mountain plover occupied habitat area.

7. To protect the identified mountain plover occupied habitat area, work schedules and shift changes would be modified from June 1 - July 10 to avoid the periods of activity from ½ hour after sunset to ½ hour before sunrise.

8. To protect the identified mountain plover occupied habitat area, fences, storage tanks, and other elevated structures would be either constructed as low as possible and/or would incorporate perch-inhibitors into their design.

9. Road-killed animals would be promptly removed from areas within ½ mile of the identified mountain plover occupied habitat area.

10. To protect the identified mountain plover occupied habitat area, seed mixes and application rates for reclamation would be designed to produce stands of sparse, low-growing vegetation suitable for plover nesting.

11. To minimize destruction of nests and disturbance to breeding mountain plovers, no reclamation activities or other ground-disturbing activities would occur from April 10 - July 10 unless surveys consistent with the Plover Guidelines or other FWS approved method find that no plovers are nesting in the area.

12. A plugged and abandoned well within ½ mile of the identified mountain plover occupied habitat area would be identified with a marker 4 feet tall with a perch inhibitor on the top of the marker.

ADDENDUM H-3

WYOMING BLM STATE DIRECTOR'S SENSITIVE SPECIES LIST AND INSTRUCTION MEMORANDUM

BLM Wyoming
Sensitive Species Policy and List

April 9, 2001

Introduction

The USDI Bureau of Land Management (BLM) Wyoming has prepared this list of sensitive species to focus species management efforts towards maintaining habitats under a multiple use mandate. Many species are not on this list due to the lack of status, distribution and habitat requirement information which prohibits any management attention.

The goals of this sensitive species policy are to:

- Maintain vulnerable species and habitat components in functional BLM ecosystems.
- Ensure sensitive species are considered in land management decisions.
- Prevent a need for species listing under the Endangered Species Act.
- Prioritize needed conservation work with an emphasis on habitat.

Authority

The authority for this policy and guidance comes from the Endangered Species Act of 1973, as amended; Title II of the Sikes Act, as amended; the Federal Land Policy and Management Act (FLPMA) of 1976; and the Department Manual 235.1.1A., General Program Delegation, Director, Bureau of Land Management.

Bureau of Land Management (BLM) Manual 6840 establishes Special Status Species (SSS) policy for plant and animal species and the habitat on which they depend. This SSS policy refers not only to species protected under the Endangered Species Act (ESA), but also to those designated by the State Director as Sensitive. The manual states *" Sec. 06D - Sensitive Species: State Directors, usually in cooperation with the State wildlife agency, may designate sensitive species. By definition the sensitive species designation includes species that could easily become endangered or extinct in the state. Therefore, if sensitive species are designated by the State Director,* ***the protection provided by the policy for candidate species shall be used as the minimum level of protection."***

Criteria set forth in the Glossary of Terms section of the 6840 Manual for designating sensitive species are:

1. under status review by the FWS/National Marine and Fisheries Service(NMFS); or
2. whose numbers are declining so rapidly that Federal listing may become necessary; or
3. with typically small or widely dispersed populations; or
4. those inhabiting ecological refugia or other specialized or unique habitats.

The intent of the sensitive species designation is to ensure actions on BLM administered lands consider the welfare of these species and do not contribute to the need to list any other Special Status Species under the provisions of the ESA. Management requirements that apply to the species on the BLM Wyoming Sensitive Species List are to avoid or minimize adverse impacts and maximize potential benefits to species whose viability has been identified as a concern by reviewing programs and activities to determine their potential effect on sensitive species. Requesting technical assistance from the FWS, and any other qualified source, on actions that may affect a sensitive species is recommended. It is not the intent of this list to track species rangewide or even statewide as this is done by other entities (WYNDD, WGFD, FWS, GAP, etc.) rather our (BLM) obligation is to determine distribution and manage habitats. It is also the intent of this list to emphasize planning, management, and monitoring of these species.

Guidance

BLM Washington Office Instruction Memorandum IM 97-118 Guidance on Special Status Species Management (6840 Manual) was issued on April 30, 1997 in response to the February 28, 1996 Fish and Wildlife Service (FWS) "Notice of Review of Plant and Animal Taxa That Are Candidates For Listing as Endangered or Threatened" (61 FR 7595). It states: *"The new candidate list eliminated the separate categories of candidates (Category-1 and Category-2) and redefined candidates to include only species for which the FWS has on file sufficient information on biological vulnerability and threat(s) to support issuance of a proposed rule to list, but for which issuance of the proposed rule is precluded by higher listing priorities. The December 5, 1996, notice made this decision to eliminate the Category-2 candidate (C2) list final. In a separate "Notice of Candidate Taxa Reclassification" (61 FR 7457), FWS reclassified 96 former Category-1 (C1) candidates to non-candidate status. Consequently, the list provided in 61 FR 7595 consists of a new candidate list which is an updated list of approximately one-half of the former C1 species, plus those species currently proposed for listing as threatened or endangered. It is, in effect, the list of proposed species and the backlog of listing proposals."*

IM 97-118 continues by reiterating BLM policy to ensure actions authorized, funded, or carried out by BLM do not contribute to the need for any species to become listed as a candidate, or for any candidate species to become listed as threatened or endangered. Early identification of BLM sensitive species is advised in efforts to prevent species endangerment, and State Directors are encouraged to collect information on species of concern to determine if BLM sensitive species designation and special management are needed. It then urges evaluation of former C1 and C2 species to determine their vulnerability to ESA listing and therefore their designation by BLM as a sensitive species, and further urges states without a sensitive species list to institute one comprised of the former C1 and C2 species that meet the 6840 Manual criteria.

BLM WY Approach

APPENDIX H: WILDLIFE MONITORING PLAN

In March 1990, an Umbrella Memorandum Of Understanding (MOU) between the Wyoming Game and Fish Department (WGFD) and USDI BLM Wyoming for Management of the Fish and Wildlife Resources on the Public Lands was signed. The purpose of the MOU was for the two agencies to work together to benefit all wildlife in Wyoming by cooperating in planning, and sharing data among other efforts. Six Appendices were planned for Specific Areas of Cooperation, one of which was titled Ecosystem Management and included the subtitle State Sensitive Species. This appendix has yet to be written although the WGFD has a Native Species Status (NSS) matrix (formerly called Species of Special Concern) identifying sensitive species, and under BLM Manual 6840 the Bureau is charged with using other agency's lists when BLM does not have a designated sensitive species list of its own.

The current status of BLM Sensitive Species lists in some adjacent states, and lists from other Federal and State agencies in Wyoming, were reviewed for this effort. BLM in Idaho listed 100 species of animals and 169 species of plants on their Sensitive Species List in 1996. In addition, they list 31 species on a Watch List for species whose populations and range appear to be restricted, but information is lacking as to the cause or if the species is headed for extinction and in need of management action to remove or reduce threats. Colorado and Arizona used the criteria from 6840 to update their lists (1998 and 2000 respectively). Arizona issued a list of 109 species, including 10 invertebrate species, in an Instruction Memorandum (IM) and Colorado updated their list to a total of 112 species in an Information Bulletin (IB). The Montana State Office issued an IM in May, 1994, listing 34 Special Status Species and 61 "Candidates" that includes the C1, 2, and 3 and proposed species. Their list has not been updated since the FWS Federal Register Notices in 1996. They have however started collecting information for Habitat Accounts that cover life histories, specific habitat requirements and a literature review for each sensitive species. BLM Utah (1997) lists a total of 178 mammal, bird, fish, reptile and amphibian species with 108 species of plants. The mammal and plant species listed by BLM Oregon/Washington numbered over 1000 species in February 2000 in 3 categories of Bureau Status: Bureau Sensitive - using the 6840 criteria; Bureau Assessment - species may need protection and are included in NEPA analyses; and Bureau Tracking - species for which more information is needed to determine status.

The Wyoming Natural Diversity Database (WYNDD) maintains a list of Wyoming Plant and Animal Species of Special Concern. It provides information on global and State abundance, legal status, and State distribution about rare species. Their Species of Special Concern criteria are: if species are vulnerable to extirpation at the global or State level due to inherent rarity; if there is a significant loss of habitat; or if the species is sensitive to human-caused mortality or habitat disturbances. This information can be found on the internet at: http://uwadmnweb.uwyo.edu/wyndd/WYNDD/SpeciesofConcern.htm

The Wyoming Game and Fish Department's Species of Special Concern (SSC) list in the 1996 Nongame Bird and Mammal Plan ranks 47 species using a matrix of population

variables and habitat variables. The codes of SSC1, SSC2, and SSC3 refer to each species' level of sensitivity and all are considered "sensitive." In 1998 the name of the matrix was changed to Native Species Status. The mammal list was revised in spring 2000 to reflect the addition of 12 species for a total of 35 mammals. The Department is actively involved in the Partner's in Flight effort to prioritize bird species of concern and develop a bird conservation plan. In November, 1999, the Habitat Protection Program (WGFD Cheyenne Office) produced a Species Watch List using State, Federal, and University of Wyoming Cooperative Fish and Wildlife Research Unit sources to develop a list of 150 species that may need management attention.

Two Forest Service (USFS) Regions cover Wyoming: Region 2 (Rocky Mountain Region) in the eastern part of the State (Bighorn, Black Hills, Medicine Bow, and Shoshone National Forests and Thunder Basin National Grassland) and Region 4 (Intermountain Region) in the western part of Wyoming (Ashley, Bridger-Teton, Caribou, Targhee, Wasatch-Cache National Forests and Flaming Gorge National Recreation Area). The original list of Vertebrate Sensitive Species for Region 4 , issued in August, 1990, listed 29 vertebrates. Their January, 1999, updated list includes 222 species of plants, mammals, birds, fish, amphibians and reptiles, the majority (200) of which are plants. Another update of the Region 4 list is planned for this fall. Region 2 is in the process of updating their 1994 list of 165 species of plants, mammals, birds, fish, amphibians and reptiles, and invertebrates. Thunder Basin National Grassland lists 8 plant and 33 vertebrate species on their Species of Concern list.

BLM resource specialists statewide were polled in March 2000 concerning development of the BLM Wyoming Sensitive Species list. Suggestions and concerns heard from the field were: the species on the sensitive species list should have declining populations throughout all or part of its range; that species are experiencing declining habitat conditions; that the species and their habitats had to be manageable; and that the list should have a limited number of species to meet the objective of focusing management attention. The population and habitat criteria expressed largely correspond with the 6840 criteria. The manageability of the species, their habitats and the list size have guided the development of this list. Also requested were management guidelines, which are not included at this time, but are seen as likely extension of this effort. General habitat requirements are provided in the table as well as statewide distribution by Field Office.

Evaluation/Monitoring/Review Process

The BLM Sensitive Species List is meant to be dynamic. The State Office wildlife and botany staff will annually review the list and solicit recommendations from BLM and non-BLM appropriate authorities for additions and deletions. If biological information shows that a species needs to be included, or removed, the appropriate Field Manager or the State Office can make a nomination for an addition or deletion with sufficient scientific justification and supporting data concerning the above-listed criteria. Under this scenario, if

such a species occurs in more than one Field Office, consensus will be sought from the other Field Offices before action is taken.

Any Federally de-listed threatened or endangered species will automatically be designated BLM Wyoming Sensitive for the 5 year monitoring period required by the ESA. Species that were evaluated in a FWS 12 month finding but were found to be "not warranted," both petitioned species and species given candidate status after 1996 will initially be included on the BLM Wyoming Sensitive Species List.

The List

Using the criteria set forth in Manual 6840 (see page 1 above), BLM Wyoming is designating the following list of plants and animals to be Sensitive Species. While using these criteria, the process of including species on the list is still subjective. This list does not include those species already formally designated by the FWS as Federally endangered, threatened, proposed, and/or candidate.

Many species are not included on the list because their status is largely unknown and basic inventory is needed. It is the BLM Wyoming's intent that the WYNDD's and WGFD's lists should be regularly consulted by field personnel to develop inventory projects designed to gather information on population size, trend, and distribution for these poorly known species. They should also be the target for budgetary funding for inventory purposes.

BLM WYOMING STATE DIRECTOR'S SENSITIVE SPECIES LIST (ANIMALS AND PLANTS)

April, 2001

Species Common Name	Scientific Name	Habitat	Designation and Ranking of others: WY Natural Heritage Program, Forest Service (FS) Regions 2 and 4; Wyoming Game and Fish (NSS), BLM states and others[1]	Occurrence by BLM Field Office[2]									
				WFO	CYFO	RFO	RSFO	LFO	CFO	BFO	NFO	KFO	PFO
MAMMALS													
Shrew, Dwarf	*Sorex nanus*	Mountain foothill shrub, grasslands	G4/S2S3, FSR2, NSS3, UT	X	X	X	X	X	X	X		X	X
Myotis, Long-eared	*Myotis evotis*	Conifer and deciduous forests, caves and mines	G5/S1B, S1?N, NSS2, ID, OR/WA, AZ	X	X	X	X	X	X	X	X	X	X
Myotis, Fringed	*Myotis thysanodes*	Conifer forests, woodland-chaparral, caves and mine	G5/S1B, S1N, FSR2, TBNG, NSS2, ID, UT, MT, OR/WA, AZ			X	X		X	X	X		
Bat, Spotted	*Euderma maculatum*	Cliffs over perennial water, basin-prairie shrub	G4/S1B, SZ?N FSR2, FSR4, NSS2, ID, CO, UT, MT, OR/WA, AZ	X	X		X	X	X	X			
Bat, Townsend's Big-eared	*Corynorhinus townsendii*	Forests, basin-prairie shrub, caves and mines	G4/S1B, S2N, FSR2, TBNG, FSR4, NSS2, ID, CO, UT, MT, OR/WA	X	X	X	X	X	X	X			
Rabbit, Pygmy	*Brachylagus idahoensis*	Basin-prairie and riparian shrub	G4/S2, NSS3, ID, MT, OR/WA, IUCN LR(nt)				X					X	X
Prairie Dog, White-tailed	*Cynomys leucurus*	Basin-prairie shrub, grasslands	G4/S2S3, NSS3, MT	X	X	X	X	X	X			X	X
Pocket Gopher, Wyoming	*Thomomys clusius*	Meadows with loose soil	G2/S1S2, NSS4, FSR2			X	X						
Pocket Gopher, Idaho	*Thomomys idahoensis*	Shallow stony soils	G4/S2?, NSS3, IUCN-LR(nt)				X					X	X
Fox, Swift	*Vulpes velox*	Grasslands	Removed from Federal Candidate list 01/08/01	X	X	X	X	X	X	X	X		
BIRDS													

Species Common Name	Scientific Name	Habitat	Designation and Ranking of others: WY Natural Heritage Program, Forest Service (FS) Regions 2 and 4; Wyoming Game and Fish (NSS), BLM states and others[1]	Occurrence by BLM Field Office[2]									
				WFO	CYFO	RFO	RSFO	LFO	CFO	BFO	NFO	KFO	PFO
Ibis, White-faced	*Plegadis chihi*	Marshes, wet meadows	G5/S1B, SZN, FSR2, TBNG, NSS3, UT, MT, CO, AZ	X	X	X	X	X	X	X	X	X	X
Swan, Trumpeter	*Cygnus buccinator*	Lakes, ponds, rivers	G4/S1B, S2N, FSR2, TBNG, FSR4, NSS2, ID, MT	X	X	X	X	X	X	X	X	X	X
Goshawk, Northern	*Accipter gentilis*	Conifer and deciduous forests	G5/S23B, S4N, FSR2, TBNG, FSR4, NSS4, ID, CO, UT, MT	X	X	X	X	X	X	X	X	X	X
Hawk, Ferruginous	*Buteo regalis*	Basin-prairie shrub, grassland, rock outcrops	G4/S3B, S3N, FSR2, TBNG, NSS3, ID, CO, MT	X	X	X	X	X	X	X	X	X	X
Falcon, Peregrine	*Falco peregrinus*	Tall cliffs	G4/T3/S1B, S2N, FSR2, TBNG, NSS3, UT	X	X	X	X	X	X	X		X	X
Sage-grouse, Greater	*Centrocercus urophasianus*	Basin-prairie shrub, mountain-foothill shrub	G5/S3, TBNG, ID, CO, UT	X	X	X	X	X	X	X	X	X	X
Grouse, Columbian Sharp-tailed	*Tympanuchus phasianellus columbianus*	Grasslands	G4/T3/S1, FSR2, FSR4, ID, CO, UT, MT			X							
Curlew, Long-billed	*Numenius americanus*	Grasslands, plains, foothills, wet meadows	G5/S3B, SZN FSR2, TBNG, NSS3, ID, CO, UT, MT	X	X	X	X	X	X	X	X	X	X
Cuckoo, Yellow-billed	*Coccyzus americanus*	Open woodlands, streamside willow and alder groves	G5/S2B, SZN, FSR2, TBNG, NNS2, UT, ID, Petitioned	X	X	X	X	X	X	X	X	X	X
Owl, Burrowing	*Athene cunicularia*	Grasslands, basin-prairie shrub	G4/S3B, SZN, FSR2, TBNG, NSS4, ID, MT, AZ	X	X	X	X	X	X	X	X	X	X
Thrasher, Sage	*Oreoscoptes montanus*	Basin-prairie shrub, mountain-foothill shrub	G5/S3B,SZN, PIF Priority	X	X	X	X	X	X	X	X	X	X
Shrike, Loggerhead	*Lanius ludovicianus*	Basin-prairie shrub, mountain-foothill shrub	G5/S4B,SZN, FSR2, TBNG, ID, MT, AZ	X	X	X	X	X	X	X	X	X	X
Sparrow, Brewer's	*Spizella breweri*	Basin-prairie shrub	G5/S3B,SZN, TBNG, PIF Priority, ID	X	X	X	X	X	X	X	X	X	X

Species Common Name	Scientific Name	Habitat	Designation and Ranking of others: WY Natural Heritage Program, Forest Service (FS) Regions 2 and 4; Wyoming Game and Fish (NSS), BLM states and others[1]	Occurrence by BLM Field Office[2]									
				WFO	CYFO	RFO	RSFO	LFO	CFO	BFO	NFO	KFO	PFO
Sparrow, Sage	*Amphispiza billineata*	Basin-prairie shrub, mountain-foothill shrub	G5/S3B,SZN, PIF Priority, ID, MT	X	X	X	X	X	X	X	X	X	X
Sparrow, Baird's	*Ammodramus bairdii*	Grasslands, weedy fields	G4/S1B, SZN, FSR2, TBNG, MT	X	X	X		X	X	X	X		
FISH													
Chub, Roundtail	*Gila robusta*	CO River drainage, mostly large rivers, also streams and lakes	G2G3/S2?, NSS1, CO, UT			X	X					X	X
Chub, Leatherside	*Gila copei*	Bear, Snake and Green drainages, clear, cool streams and pools	G3G4/S2, NSS1, ID, UT				X					X	X
Sucker, Bluehead	*Catostomus discobolus*	Bear, Snake and Green drainages, all waters	G4/S2S3, NSS1, CO, UT			X	X					X	X
Sucker, Flannelmouth	*Catostomus latipinnis*	CO River drainage, large rivers, streams and lakes	G3G4/S3, NSS1, CO, UT			X	X					X	X
Trout, Yellowstone Cutthroat	*Oncorhynchus clarki bouvieri*	Yellowstone drainage, small mountain streams and large rivers	G4T2/S2, FSR2, NSS3, ID, MT	X	X			X		X			X
Trout, Colorado River Cutthroat	*Oncorhynchus clarki pleuriticus*	CO River drainage, clear mountain streams	G4T2T3/S2, FSR2, FSR4, NSS2, CO, UT, Petitioned			X	X					X	X
Trout, Bonneville Cutthroat	*Oncorhynchus clarki utah*	Bear R. drainage, clear mountain streams	G4T2/S1S2, NSS2, FSR4, ID, UT, Petitioned									X	
Trout, Fine-spotted Snake River Cutthroat	*Oncorhynchus clarki spp*	Snake R. drainage, clear, fast water	G4T1T2Q/S1, NSS4, FSR4, Petitioned									X	X
REPTILES													
Rattlesnake, Midget Faded	*Crotalus viridis concolor*	Mountain foothills shrub, rock outcrop	G5T3/S1S2, CO				X						
AMPHIBIANS													
Frog, Northern Leopard	*Rana pipiens*	Beaver ponds, permanent water in plains and foothills	G5/S3, FSR2, TBNG, NSS4, CO, ID, MT	X	X	X	X	X	X	X	X	X	X
Spadefoot, Great Basin	*Spea intermontana*	Spring seeps, permanent and temporary waters	G5/S4, NSS4, CO			X	X	X				X	

Species Common Name	Scientific Name	Habitat	Designation and Ranking of others: WY Natural Heritage Program, Forest Service (FS) Regions 2 and 4; Wyoming Game and Fish (NSS), BLM states and others[1]	Occurrence by BLM Field Office[2]									
				WFO	CYFO	RFO	RSFO	LFO	CFO	BFO	NFO	KFO	PFO
Toad, Boreal (Northern Rocky Mountain population)	*Bufo boreas boreas*	Pond margins, wet meadows, riparian areas	G4T4/S2,NSS2, FSR2, FSR4, UT, ID		X	X	X	X				X	X
Frog, Spotted	*Ranus pretiosa (lutieventris)*	Ponds, sloughs, small streams	G4/S2S3, FSR2, FSR4, NSS4, ID, UT, MT		X		X	X		X		X	X
PLANTS													
Meadow Pussytoes	*Antennaria arcuata*	Moist, hummocky meadows, seeps or springs surrounded by sage/grasslands 4,950-7,900'	G2/S2				X	X					X
Laramie Columbine	*Aquilegia laramiensis*	Crevices of granite boulders & cliffs 6,400-8,000'	G2/S2, FSR2			X			?				
Small Rock Cress	*Arabis pusilla*	Cracks/Crevices in sparsely vegetated granite/pegmatite outcrops w/in sage/grasslands 8,000-8,100'	G1/S1Removed from Federal Candidate list 10/25/99				X						
Mystery Wormwood	*Artemisia biennis var. diffusa*	Clay flats & playas 6,500'	G5T1/S1				P						
Porter's Sagebrush	*Artemisia porteri*	Sparsely vegetated badlands of ashy or tufaceous mudstone & clay slopes 5,300-6,500'	G2/S2					X	X	X			
Dubois Milkvetch	*Astragalus gilviflorus var. purpureus*	Barren shale, badlands, limestone, & redbed slopes & ridges 6,900-8,800'	G5T2/S2					X					
Hyattville Milkvetch	*Astragalus jejunus var. articulatus*	Sparsely vegetated stony ridges & barren red clay slopes 4,900-5,900'	G3T1/S1	X									
Nelson's Milkvetch	*Astragalus nelsonianus* -or- *Astragalus pectinatus var. platyphyllus*	Alkaline clay flats, shale bluffs and gullies, pebbly slopes, and volcanic cinders in sparsely vegetated sagebrush, juniper, & cushion plant communities at 5200-7600'	G2/S2, CO			X	X	X	X				
Trelease 's Milkvetch	*Astragalus racemosus var. treleasei*	Sparsely vegetated sagebrush communities on shale or limestone outcrops & barren clay slopes at 6500-8200'	G5T2/S1									X	X

Species Common Name	Scientific Name	Habitat	Designation and Ranking of others: WY Natural Heritage Program, Forest Service (FS) Regions 2 and 4; Wyoming Game and Fish (NSS), BLM states and others[1]	Occurrence by BLM Field Office[2]									
				WFO	CYFO	RFO	RSFO	LFO	CFO	BFO	NFO	KFO	PFO
Precocious Milkvetch	*Astragalus proimanthus*	Cushion plant communities on rocky, clay soils mixed with shale on summits & slopes of white shale hills 6,800-7,200'	G1/S1				X						
Cedar Rim Thistle	*Cirsium aridum*	Barren, chalky hills, gravelly slopes, & fine textured, sandy-shaley draws 6,700-7,200'	G2Q/S2			X	X	X					X
Ownbey's Thistle	*Cirsium ownbeyi*	Sparsely vegetated shaley slopes in sage & juniper communities 6,440-8,400'	G3/S2				X						
Many-stemmed Spider-flower	*Cleome multicaulis*	Semi-moist, open saline banks of shallow ponds & lakes with baltic rush & bulrush 5,900'	G2G3/S1						X				
Owl Creek Miner's Candle	*Cryptantha subcapitata*	Sandy-gravelly slopes & desert ridges on sandstones of the Winds River Formation 4,700-6,000'	G1/S1					X					
Evert's Wafer-Parsnip	*Cymopterus evertii*	Coarse volcanic soils or sandstone outcrops dominated by cushion plants or sparse shrublands in openings within Rcky Mtn juniper or Limber pine woodlands at 5,900-10,900'	G2G3/S2S3	?	X								
Williams' Wafer-Parsnip	*Cymopterus williamsii*	Open ridgetops & upper slopes with exposed limestone outcrops or rockslides 6,000-8,300'	G3/S3	X					X	X			
Wyoming Tansymustard	*Descurainia torulosa*	Sparsely vegetated sandy slopes at base of cliffs of volcanic breccia or sandstone 8,300-10,000'	G1/S1				X						
Weber's Scarlet-Gilia	*Ipomopsis aggregata ssp. weberi*	Openings in coniferous forests & scrub oak woodlands 8,500-9,600'	G5T1T2Q/S1, FSR2			X							
Entire-Leaved Peppergrass	*Lepidium integrifolium var. integrifolium*	WY poplns occur in sparsely vegetated and seasonally wet clay flats, greasewood communities on clay hummocks, and moist alkaline meadows at 6,200-6,770'	G2T1?/S1									X	

Species Common Name	Scientific Name	Habitat	Designation and Ranking of others: WY Natural Heritage Program, Forest Service (FS) Regions 2 and 4; Wyoming Game and Fish (NSS), BLM states and others[1]	Occurrence by BLM Field Office[2]									
				WFO	CYFO	RFO	RSFO	LFO	CFO	BFO	NFO	KFO	PFO
Sidesaddle Bladderpod	*Lesquerella arenosa var. agrillosa*	Dry, open rock outcrops of gravel, shale, or limestone & barren, often seleniferous, roadsides 4,200-4,300'	G5T3/S1								X		
Fremont Bladderpod	*Lesquerella fremontii*	Rocky limestone slopes & ridges 7,000-9,000'	G2/S2					X					
Large-fruited Bladderpod	*Lesquerella macrocarpa*	Gypsum-clay hills & benches, clay flats, & barren hills 7,200-7,700'	G2/S2				X					X	X
Western Bladderpod	*Lesquerella multiceps*	Dry, gravelly limestone ridges & slopes in sparse grasslands or cushion plant communities at 8,300-8,600'	G3/S1									?	
Prostrate Bladderpod	*Lesquerella prostrata*	Cushion plant or sparse sage grassland communities on slopes and rims of whitish to reddish or gray limey clays & soft sandstones with a surface layer of fine gravel at elevations of 7,200-7,700'	G3/S1									X	
Absaroka Beardtongue	*Penstemon absarokensis*	Sparsely vegetated openings on steep slopes of loose volcanic rubble or outcrops of dry andesitic volcanic rock at 5,920-10,000'	G2/S2		X								
Stemless Beardtongue	*Penstemon acaulis var. acaulis*	Cushion plant or Black sage grassland communities on semi-barren rocky ridges, knolls, & slopes at 5,900-8,200'	G3T2/S1				X						
Cary Beardtongue	*Penstemon caryi*	Calcareous rock outcrops & rocky soil w/in sage, juniper, Doug-fir, & limber pine communities 5,200-8,500'	G3/S2, FSR2	X	X					X			
Gibbens' Beardtongue	*Penstemon gibbensii*	Sparsely vegetated shale or sandy-clay slopes 5,500-7,700'	G1/S1			X							
Beaver Rim Phlox	*Phlox pungens*	Sparsely vegetated slopes on sandstone, siltstone, or limestone substrates 6,000-7,400'	G2/S2				X	X				X	X
Tufted Twinpod	*Physaria condensata*	Sparsely vegetated shale slopes & ridges 6,500-7,000'	G2/S2				X					X	X

Species Common Name	Scientific Name	Habitat	Designation and Ranking of others: WY Natural Heritage Program, Forest Service (FS) Regions 2 and 4; Wyoming Game and Fish (NSS), BLM states and others[1]	Occurrence by BLM Field Office[2]									
				WFO	CYFO	RFO	RSFO	LFO	CFO	BFO	NFO	KFO	PFO
Dorn's Twinpod	*Physaria dornii*	Dry, calcareous-shaley soils on slopes & ridges w/mountain mahogany & rabbitbrush 6,500-7,200'	G1/S1									X	
Rocky Mountain Twinpod	*Physaria saximontana var. saximontana*	Sparsely vegetated rocky slopes of limestone, sandstone or clay 5,600-8,300'	G3T2/S2	X				X					
Persistent Sepal Yellowcress	*Rorippa calycina*	Riverbanks & shorelines, usu on sandy soils near high-H^2O line	G3/S2S3	X	X	X		X					
Shoshonea	*Shoshonea pulvinata*	Shallow, stony calcareous soils of exposed limestone outcrops, ridgetops, & talus slopes 5,900-9,200'	G2G3/S2		X			?					
Pale Blue-eyed Grass	*Sisyrinchium pallidum*	Wet meadows, stream banks, roadside ditches, & irrigated meadows 7,000-7,900'	G2G3/S2S3			X							
Laramie False Sagebrush	*Sphaeromeria simplex*	Cushion plant communities on rocky limestone ridges & gentle slopes 7,500-8,600'	G2/S2			X			X				
Green River Greenthread	*Thelesperma caespitosum*	White shale slopes & ridges of Green River Formation 6,300'	G1/S1				X						
Uinta Greenthread	*Thelesperma pubescens*	Sparsely vegetated benches & ridges on coarse, cobbly soils of Bishop Conglomerate 8,200-8,900'	G1/S1				X						
Cedar Mtn. Easter Daisy	*Townsendia microcephala*	Rocky slopes of Bishop Conglomerate 8,500'	G1/S1				X						
Barneby's Clover	*Trifolium barnebyi*	Ledges, crevices, & seams on reddish -cream Nugget Sandstone outcrops 5,600-6,700'	G1/S1					X					
TOTALS			**78 species statewide**	**28**	**29**	**37**	**48**	**37**	**28**	**26**	**18**	**37**	**34**

[1] **Rankings**

Heritage Program

WYNDD uses a standardized ranking system developed by The Nature Conservancy's Natural Heritage Network to assess the global and statewide conservation status of each plant and animal species, subspecies, and variety. Each taxon is ranked on a scale of 1-5, from highest conservation concern to lowest. Codes are as follows:

G	Global rank: Rank refers to the rangewide status of a species.
T	Trinomial rank: Rank refers to the rangewide status of a subspecies or variety.
S	State rank: Rank refers to the status of the taxon (species or subspecies) in Wyoming. State ranks differ from state to state.
1	Critically imperiled because of extreme rarity (often known from 5 or fewer extant occurrences or very few remaining individuals) or because some factor of a species' life history makes it vulnerable to extinction.
2	Imperiled because of rarity (often known from 6-20 occurrences) or because of factors demonstrably making a species vulnerable to extinction.
3	Rare or local throughout its range or found locally in a restricted range (usually known from 21-100 occurrences).
4	Apparently secure, although the species may be quite rare in parts of its range, especially at the periphery.
5	Demonstrably secure, although the species may be rare in parts of its range, especially at the periphery.
H	Known only from historical records. 1950 is the cutoff for plants; 1970 is the cutoff date for animals.
X	Believed to be extinct.
A	Accidental or vagrant: A taxon that is not known to regularly breed in the state or which appears very infrequently (typically refers to birds and bats).
B	Breeding rank: A state rank modifier indicating the status of a migratory species during the breeding season (used mostly for migratory birds and bats)
N	Nonbreeding rank: A state rank modifier indicating the status of a migratory species during the non-breeding season (used mostly for migratory birds and bats)
ZN or ZB	Taxa that are not of significant concern in Wyoming during breeding (ZB) or non-breeding (ZN) seasons. Such taxa often are not encountered in the same locations from year to year.
U	Possibly in peril, but status uncertain; more information is needed.
Q	Questions exist regarding the taxonomic validity of a species, subspecies, or variety.
?	Questions exist regarding the assigned G, T, or S rank of a taxon.

State Status

The Wyoming Game and Fish Department has developed a matrix of habitat and population variables to determine the conservation priority of all native, breeding bird and mammal species in the state. Six classes of Native Status Species (NSS) are recognized, of which classes 1, 2, and 3 are considered to be high priorities for conservation attention.

These classes can be defined as follows:

NSS1 Includes species with on-going significant loss of habitat and with populations that are greatly restricted or declining (extirpation appears possible).

NSS2 Species in which (1) habitat is restricted or vulnerable (but no recent or significant loss has occurred) and populations are greatly restricted or declining; or (2) species with on-going significant loss of habitat and populations that are declining or restricted in numbers and distribution (but extirpation is not imminent).

NSS3 Species in which (1) habitat is not restricted, but populations are greatly restricted or declining (extirpation appears possible); or (2) habitat is restricted or vulnerable (but no recent or significant loss has occurred) and populations are declining or restricted in numbers or distribution (but extirpation is not imminent); or (3) significant habitat loss is on-going but the species is widely distributed and population trends are thought to be stable.

Forest Service

Region 2 - Rocky Mountain Region
Region 4 - Intermountain Region
TBNG - Thunder Basin National Grassland

Other BLM states

AZ	Arizona
CO	Colorado
ID	Idaho
MT	Montana
OR/WA	Oregon/Washington
UT	Utah

IUCN - International Union for Conservation of Nature, Rodent Specialist Group. North American Red List. LOWER RISK (LR) - A taxon is Lower Risk when it has been evaluated, does not satisfy the criteria for any of the categories Critically Endangered, Endangered or Vulnerable. Taxa included in the Lower Risk category can be separated into three subcategories:

1.Conservation Dependent (cd). Taxa which are the focus of a continuing taxon-specific or habitat-specific conservation programme targeted towards the taxon in question, the cessation of which would result in the taxon qualifying for one of the threatened categories above within a period of five years.

2.Near Threatened (nt). Taxa which do not qualify for Conservation Dependent, but which are close to qualifying for Vulnerable.

3.Least Concern (lc). Taxa which do not qualify for Conservation Dependent or Near Threatened.

PIF - Partners in Flight, a coalition of federal, state and provincial agencies, private groups, corporations and individuals dedicated to neotropical migratory bird conservation

Petitioned- Species which has been petitioned for listing under the Endangered Species Act

2 Occurrence by BLM Field Office

WFO Worland

CFYO	Cody
RFO	Rawlins
RSFO	Rock Springs
LFO	Lander
CFO	Casper
BFO	Buffalo
NFO	Newcastle
KFO	Kemmerer
PFO	Pinedale

For Plants:
P - Indicates occurrence within BLM Field Office area on Private Land Ownership
S - Indicates occurrence within BLM Field Office area on State Land Ownership
F - Indicates occurrence within BLM Field Office area on other Federal Land Ownership
? - Indicates likely occurrence within BLM Field Office area

APPENDIX I

BIOLOGICAL ASSESSMENT:

Threatened, Endangered, and Proposed Species
for the
Desolation Flats Natural Gas Development Project

APPENDIX I

Biological Assessment
of
Threatened, Endangered, and Proposed Species
for the
Desolation Flats Natural Gas Development Project

Prepared by

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June, 2002

APPENDIX I

BIOLOGICAL ASSESSMENT

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APPENDIX I: BIOLOGICAL ASSESSMENT

1.0 Project Description

Marathon Oil Company has notified the Bureau of Land Management (BLM), Rawlins and Rock Springs Field Offices, that Marathon and other cooperators, including EOG Resources, Inc.; Tom Brown, Inc.; Basin Exploration, Inc.; Yates Petroleum Corporation; Questar Exploration and Production Company; Merit Energy Company; and Santa Fe Snyder Corporation; intend to drill additional exploration and development wells in and adjacent to the Willow Reservoir, Wedge, Mulligan Draw, Powder Mountain, Desolation Flats, Ruger, Dripping Rock, Cedar Chest, Triton, and Lookout Wash Units and the surrounding areas (collectively referred to as the Desolation Flats Project Area). On the Desolation Flats Project Area (DFPA) the Almond Flats formation is currently being drilled from several active natural gas fields where well spacing is predominantly one well per section. In addition, the area contains several active Federal Units, some of which are subject to current drilling programs. The Desolation Flats Project Area has 68 active producing wells, with accompanying production-related facilities. Up to 4 well locations may be developed per section with existing development. Drilling is expected to occur over a 20-year period, with the project life of 30-50 years.

Three alternatives have been developed for the proposed project: the Proposed Action, Alternative A, and Alternative B (no action). Maximum well pad density under the alternatives could reach 4 per section (square mile). Descriptions of each alternative are discussed in detail in Chapter 2 of the Draft Environmental Impact Statement (DEIS) (USDI-BLM 2002) and are summarized below.

- The Proposed Action is to drill approximately 385 natural gas wells at 361 well locations over the next 20 years. The forecasted success rate of wells is 65 percent (250 producing wells). Drilling estimations were based on reasonably foreseeable spacing and drilling projections into areas within the project area where the planned production and development activities would occur. The drilling proposal is in addition to existing drilling and production operations. Existing disturbance within the DFPA is approximately 1,506 acres, or around 0.6 percent of the 233,542 acres comprising the project area. During the construction phase, the Proposed Action would disturb 4,923 acres. During the production phase disturbance areas within the DFPA will be reduced through the reclamation of pipeline right-of-ways (ROW), unused portions of drill pads, dry holes and ancillary facility disturbances. Under the Proposed Action, reclamation will reduce impacts to 2,139 acres for a total impact of 3,645.4 acres, or 1.6 percent of the DFPA.

- Under Alternative A, 592 natural gas wells would be drilled at 555 locations over the next 20 years. During the construction phase, Alternative A would disturb 7,582 acres. With Implementation of reclamation under Alternative A, impacts will be reduced to 3,300 acres with total impacts affecting 4,806.4 acres, or about 2.1 percent of the DFPA.

- Alternative B (no action) would allow Applications for Permit(s) to Drill (APD's) and ROW actions to be granted by the BLM on a case-by-case basis through individual project and site-specific environmental analysis. Additional natural gas development could occur on State and private lands within the project area under APD's approved by the Wyoming Oil and Gas Conservation Commission. Under Alternative B, additional surface disturbance would occur on a case-by-case basis.

This Biological Assessment (BA) discusses the potential effects of the proposed development on species that are listed as threatened, endangered, or proposed for listing under the Endangered

Species Act (ESA) of 1973. This BA also presents recommendations to assure that the construction and subsequent operation of the proposed project will neither jeopardize the continued existence of those species nor result in the destruction or adverse modification of their critical habitats. Analysis of effects of this proposed project on threatened, endangered and proposed species complies with the provisions of the ESA.

1.1 Project Area Location

The DFPA is located in south-central Wyoming's Carbon and Sweetwater counties, within Townships 13 through 16 North (T13-16N) and Ranges 93 through 96 West (R93-96W) of the 6th principal meridian. The project area encompasses approximately 233,542 acres. Of this total, approximately 224,742 acres are managed by the U.S. Department of the Interior (USDI) BLM, 2,320 acres are managed by the State and 6,480 acres are private lands. A detailed description of the project area location is set forth in Section 1.1 of the DEIS (USDI-BLM 2002).

2.0 Methods

The assessments and recommendations contained within this BA are based upon information obtained from several sources: (1) on-site surveys, (2) meetings with state and federal agency wildlife specialists, (3) personal and telephone interviews with concerned parties and wildlife specialists, (4) examination of pertinent data in state and federal agency files, and (5) the review of pertinent biological and management literature.

2.1 Published Literature

Published scientific documents that pertain directly to the specific circumstances and issues involved in this analysis were reviewed and incorporated into this BA. All published literature used in this assessment is appropriately cited.

2.2 Unpublished Agency Reports and Data

Unpublished documents and data sets from the files of the Wyoming Game and Fish Department (WGFD) and U.S. Fish and Wildlife Service (FWS) were reviewed, utilized, and referenced in this BA. All available information on threatened and endangered species in the project area was reviewed in the preparation of the DEIS and this document. Materials reviewed include distribution and habitat maps, progress reports, recovery plans, sighting records, management plans, and survey guidelines for threatened and endangered species.

Some information concerning historical wildlife usage of the project area was obtained through the BLM's field offices in Rawlins and Rock Springs, Wyoming and District IV biologists of the WGFD. This information was specific to current and historical locations for wildlife species. Additional information was obtained from the WGFD which maintains a computerized listing of all wildlife species reported in an area. This listing, known as the Wildlife Observation System (WOS) was accessed for information concerning all species of wildlife (birds, mammals, amphibians, and reptiles) that have been observed and recorded within the DFPA and a township buffer (T12-17N, R92-97W) as residents or seasonal migrants. The Wyoming Natural Diversity Database (WYNDD) was also queried for reports of rare or unique plant and wildlife species on and within a township buffer of the DFPA.

2.3 Personal Communications

Individuals interviewed during the fact-finding process, either directly or by telephone, included: Mr. Larry Apple (BLM Wildlife Biologist, Rawlins), Mr. Frank Blomquist (BLM Wildlife Biologist, Rawlins), Ms. Andrea Cerovski (WGFD Non-Game Bird Biologist, Cheyenne), Ms. Pat Deibert (FWS Biologist, Cheyenne), Mr. Jim Dunder (BLM Wildlife Biologist, Rock Springs), Mr. Walt Fertig (WYNDD Heritage Biologist, Laramie), Ms. Mary Read (BLM Wildlife Biologist, Rawlins), Mr. Andy Warren (BLM Range Conservation Officer, Rawlins), and Mr. Tim Woolley (WGFD Wildlife Biologist, Baggs).

2.4 Site Inspections

Existing special status wildlife information for the project area was supplemented through wildlife surveys conducted by Hayden-Wing Associates (HWA) during 2000 and 2001. These data collections consisted of aerial and ground surveys to determine: (1) occurrence of threatened, endangered, proposed, candidate, or sensitive species and/or habitat that may occur on the project area (USDI-FWS 2002, USDI-BLM 2001); (2) the occurrence, location, size, and burrow density of white-tailed prairie dog colonies; (3) the location and activity status of raptor nests within the project area and two-mile buffer zone; and (4) the occurrence, location, and size of mountain plover habitat and documentation of the presence/absence of mountain plovers within these habitats.

2.5 Meetings

Numerous meetings were held among state and federal wildlife specialists and Hayden-Wing Associates concerning potential impacts to wildlife that may result from the proposed project. All of the concerns raised in these meetings regarding development of the proposed project have been addressed in either this document, the DEIS (USDI-BLM 2002), or in the Wildlife and Fisheries Technical Report for the Desolation Flats Project Area (HWA 2002).

2.6 BA Preparation

Personnel who cooperated in the preparation of this BA include the following: L.D. Hayden-Wing, principal investigator of Hayden-Wing Associates and a member of the Inter-Disciplinary Team, supervised the collection of wildlife data and compilation of the overall document. T. Olson, senior wildlife biologist with HWA, assisted in the preparation of the document and data collection. S. Mullner, J. Winstead, K. Jones, and D. Knowlton, wildlife biologists with HWA, assisted in collection of field data.

3.0 Current Status, Habitat Use and Behavior of Species

The FWS has determined that eight species of wildlife and fish and one plant species, listed under the ESA as either threatened, endangered, or proposed for listing are potentially present in or near the project area (USDI-FWS 2002). The species that may occur on or adjacent to the project area, and their federal status under the ESA, are listed in Table 3-1.

Table 3-1. Threatened, Endangered, and Proposed Wildlife Species Potentially Present on or Near the DFPA.[1]

Species	Scientific Name	Status
Mammals		
Black-footed ferret	*Mustela nigripes*	Endangered
Canada lynx	*Lynx canadensis*	Threatened
Birds		
Bald eagle	*Haliaeetus leucocephalus*	Threatened
Mountain plover	*Charadrius montanus*	Proposed
Fish		
Bonytail	*Gila elegans*	Endangered
Colorado pikeminnow	*Ptychocheilus lucius*	Endangered
Humpback chub	*Gila cypha*	Endangered
Razorback sucker	*Xyrauchen texanus*	Endangered
Plants		
Ute ladies'-tresses	*Spiranthes diluvialis*	Threatened

[1] Source: (USDI-FWS 2002)

3.1 Wildlife Species

Black-footed Ferret and Associated White-tailed Prairie Dog Colonies. The black-footed ferret's original distribution in North America closely corresponded to that of prairie dogs (Hall and Kelson 1959, Fagerstone 1987). In central Wyoming, white-tailed prairie dog (*Cynomys leucurus*) colonies provide essential habitat for black-footed ferrets. Ferrets depend almost exclusively on prairie dogs for food and they also use prairie dog burrows for shelter, parturition, and raising their young (Hillman and Clark 1980, Fagerstone 1987).

Aerial surveys were systematically conducted over the entire DFPA, plus a 2-mile buffer, during April 2000 to locate white-tailed prairie dog colonies. The colony locations were recorded with a Global Positioning System and then surveyed and mapped in their entirety from the ground during the summer of 2000. Fifty-nine areas containing prairie dog burrows were documented (Figure 3-1). Collectively, a total of 9,967 acres of white-tailed prairie dog colonies were identified (2.6 % of the surveyed area). A large portion of these colonies, 4,229 acres, was located outside of DFPA within the 2-mile buffer. Surveys were conducted to estimate prairie dog burrow density within each colony according to Biggins et al. (1989). Active burrow density was greater than or equal to 8 per acre in 43 colonies and less than 8 per acre in 9 colonies (Table 3-2). Seven colonies were smaller than 12 acres and burrow density surveys were not conducted. Prairie dog colony complexes were delineated by associating colonies according to Biggins et al. (1989). Prairie dog colonies within the DFPA formed two large complexes (Figure 3-1). All 59 colonies were included in the two complexes. Complex 1 encompasses 54 colonies and a total of 9,450 acres and extends just beyond the 2-mile buffer. Complex 2 encompasses 5 colonies and a total of 517 acres. A minimum of 200 acres of white-tailed prairie dog colonies and a minimum density of eight

active burrows per acre is required to support black-footed ferrets (USDI-FWS 1989). The size of the complexes and density of burrows indicate that ferret surveys will be necessary prior to ground disturbing activities in these areas (USDI-FWS 1989). When a black-footed ferret survey is required the entire town must be surveyed.

No confirmed black-footed ferret sightings have been reported within the DFPA (WGFD 2000, WYNDD 2000, and Jim Dunder, Wildlife Biologist, Rock Springs Field Office, personal communication). The WGFD atlas does, however, indicate that historic sightings of black-footed ferrets have been made within the project area (WGFD 1999) and an unconfirmed sighting of a black-footed ferret southwest of Monument Valley was reported in 1992 (Jim Dunder, personal communication).

Table 3-2. Location, Size, and Burrow Density of White-tailed Prairie Dog Colonies Located on or Near the DFPA.

Colony #	Location			Area (ac.)	Transects sampled	Transects with burrow density ≥ 8 per arce[a]
	Town N	Range W	Section			
1	15	93	3	3,145.5	168	47
2	15	93	6	118.6	8	2
3	16	93	31	243.0	17	2
4	15	93	6	2.5	0	NA[b]
5	15	94	2	14.8	2	1
6	15	94	11	11.4	2	2
7	15	94	12	22.5	2	0
8	15	93	8	116.0	8	2
9	15	93	9	5.5	0	NA[b]
10	15	93	13	673.3	48	3
11	15	94	22	43.2	4	0
12	16	93	22	2,396.1	157	26
13	16	96	34	178.1	13	8
14	16	96	28	52.7	4	3
15	16	96	27	156.7	13	4
16	16	96	22	112.8	7	1
17	15	94	35	84.1	6	3
18	14	94	4	1.2	1	0
19	14	94	5	42.1	3	1
20	14	94	6	9.1	1	1
21	15	94	31	3.9	1	0
22	15	94	29	59.0	4	1
23	14	93	7	9.5	2	0
24	14	93	18	35.6	4	0
25	14	94	24	5.1	1	1
26	14	94	24	17.9	2	2

Table 3-2. Continued.

Colony #	Location Town N	Range W	Section	Area (ac.)	Transects sampled	Transects with burrow density > 8 per arce[a]
27	14	94	25	4.3	1	1
28	14	94	25	8.5	1	1
29	14	94	25	0.6	0	NA[b]
30	14	94	25	0.6	0	NA[b]
31	14	94	25	0.8	0	NA[b]
32	14	94	25	0.9	0	NA[b]
33	14	94	36	114.9	5	4
34	14	94	26	13.3	3	2
35	13	94	2	241.1	15	11
36	14	93	31	620.2	39	14
37	13	94	1	18.1	2	2
38	13	94	12	40.8	4	4
39	13	94	11	2.0	5	1
40	13	94	11	27.0	1	0
41	13	94	12	45.1	3	3
42	13	94	10	254.9	15	8
43	13	94	11	11.0	3	0
44	13	94	14	0.6	0	NA[b]
45	13	94	15	56.5	4	4
46	13	94	14	36.8	2	1
47	13	94	23	33.3	4	4
48	13	94	21	44.0	4	2
49	13	94	2	8.0	1	1
50	13	93	18	370.9	20	14
51	13	93	30	135.4	9	8
52	13	94	19	20.9	2	1
53	13	95	13	20.4	3	1
54	15	93	23	221.1	15	5
55	13	94	14	7.4	2	0
56	15	94	23	21.6	2	1
57	15	93	7	0.5	1	1
100	13	95	8	8.5	1	1
101	16	95	29	17.6	3	3
			Totals	9,967.6	648	208

[a] A single transect having eight burrows or more per acre is adequate for the entire colony to be considered potential black-footed ferret habitat (Biggins et al. 1989).

[b] NA indicates that these colonies were not assessed for burrow density because they were smaller than 12 acres.

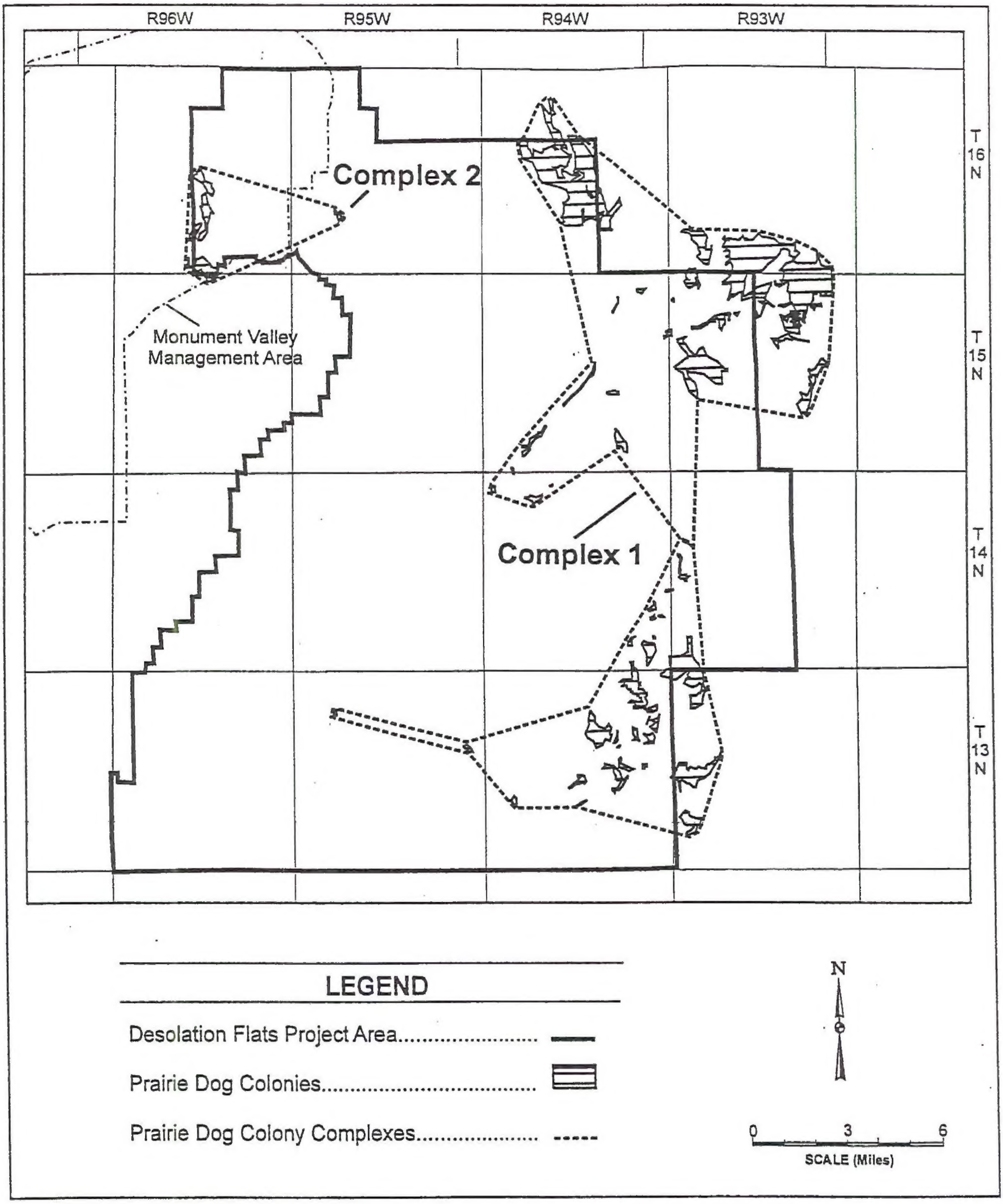

Figure 3-1. White-tailed Prairie Dog Colonies and Complexes in Relation to the Desolation Flats Project Area.

Canada Lynx. The Canada lynx is one of three major species of wildcats found in North America. Although Wyoming comprises part of the species' historic geographical range, no lynx sightings have been documented within a six-mile buffer of the DFPA (WGFD 2000). In a collaborative effort, the BLM, FWS, and Forest Service (FS) recently completed a map of lynx habitat in the State of Wyoming; according to the habitat map, lands within the DFPA do not provide lynx habitat (McKelvey et al. 1999).

Due to the facts that: (1) the project area does not include high elevation lodgepole pine/spruce-fir habitat types preferred by this species, (2) the project area does not support a population of snowshoe hares (WGFD 2000), (3) there are no recorded lynx sightings within a six-mile buffer in either the WOS (WGFD 2000) or the WYNDD (2000), and (4) the closest potential habitat is more than 20 miles to the east in the Sierra Madre Mountains, it is unlikely that lynx occur or will occur on or near the DFPA.

Bald Eagle. As of the July 12, 1995 Federal Register, the bald eagle is no longer classified as endangered and has been down-listed by the FWS to the status of threatened in the lower 48 states. Bald eagles typically build stick nests in the tops of coniferous or deciduous trees along streams, rivers, or lakes; they may also select cliffs and ledges as nest substrates (Call 1978). Selection of nest trees appears to depend, in part, on food availability early in the nesting season (Swenson et al. 1986). Primary wintering areas are typically associated with concentrations of food sources along major rivers that remain unfrozen where fish and waterfowl are available and near ungulate winter ranges that provide carrion (Montana Bald Eagle Working Group 1990). Wintering bald eagles are also known to roost in forests with large, open conifers and snags protected from winds by ridges, often near concentrations of domestic sheep and big game (Anderson and Patterson 1988).

The bald eagle winters and nests in close proximity to the project area along the Little Snake River, and numerous observations, both on and proximal to the project area, are listed in the WOS (WGFD 2000). A large number of incidental bald eagle sightings (70) have been recorded within a six-mile buffer of the project area (WGFD 2000). This six-mile buffer includes portions of the Little Snake River, which is located approximately 2.5 miles from the southern edge of the project area boundary. Most observations (91%) were documented between November and March, indicating that the area is primarily used as wintering habitat.

Several factors probably allow for seasonal and/or year-round use by bald eagles along the Little Snake River: (1) the river provides opportunities to capture prey including fish and waterfowl, (2) the river is located near crucial mule deer, elk, and pronghorn winter range, (3) domestic sheep production is present, and (4) the riparian zone along the river provides potential roosting and nesting sites. However, upland habitat use by bald eagles within the project area would probably be limited to winter hunting/scavenging forays. Very few, if any, trees large enough for eagle roosting or nesting exist on the DFPA.

Inspection of BLM and WGFD raptor nest records and results of aerial and ground raptor nest surveys during 2000 (HWA 2002) revealed that no active bald eagle nests occurred within the DFPA or a 2-mile buffer. No known winter roost sites are located within the DFPA or a 2-mile buffer.

Mountain Plover. The mountain plover nests across much of Wyoming, but preferred habitat is limited throughout its range (Oakleaf et al. 1982, Dinsmore 1983, Leachman and Osmundson 1990). This ground-nesting species is typically found in areas of short (less than four inches)

vegetation on slopes of less than three percent. Any short grass, very short shrub, or cushion plant community could be considered potential plover nesting habitat (Parrish et al. 1993), however, mountain plovers prefer shortgrass prairie with open, level or slightly rolling areas dominated by blue grama and buffalo grass (Graul 1975, Dinsmore 1981, Dinsmore 1983, Kantrud and Kologiski 1982, Knopf 1996). These habitats are quite often associated with prairie dog colonies, and researchers have found that plovers use prairie dog colonies more often than other areas (Knowles et al. 1982, Knowles and Knowles 1984, Olson and Edge 1985). However, mountain plovers are capable of using suitable habitats not specifically associated with prairie dog colonies.

The DFPA was surveyed for mountain plovers and mountain plover habitat in June, 2000 and again in the spring of 2001 (HWA 2002). Plover habitat evaluations were conducted in accordance with the protocol outlined in the *Final Biological and Conference Opinions for the Proposed Continental Divide/Wamsutter II Natural Gas Project* (USDI-FWS 2000). Potential plover habitats identified during 2000 were again surveyed for plovers in 2001. The project area provides approximately 25,415 acres (10.9% of the project area) of potential mountain plover habitat (Figure 3-2). Some "islands" of non-habitat such as dense sagebrush are included within the greater polygons of designated plover habitat, however plover are capable of utilizing relatively small habitat patches within a sagebrush matrix.

Mountain plovers were observed in numerous locations in the northern half of the DFPA (Figure 3-2). There are also recorded sightings of mountain plovers within a six-mile buffer of the project area (WGFD 2000, WYNDD 2000). During 2000 and 2001 surveys, mountain plovers were observed within 9,202 acres (3.9% of the project area) of the designated potential mountain plover habitat polygons; none were observed in the remaining 16,213 acres of designated potential mountain plover habitat (Figure 3-2). Plovers with young were found on one site (Section 4, T15N:R93W) during the 2001 production survey.

3.2 Fish Species

Intermittent/ephemeral runoff generated by spring snowmelt and summer thunderstorm events flows into Sand Creek and then into the Little Snake River, a tributary of the Colorado River System. Surface water is scarce and perennial streams are not present within the DFPA. Sand Creek may flow during wet years, but not consistently over time. All of the streams in the project area are classified as Class 5 streams by the WGFD (1991).

Four federally endangered fish species may occur as downstream residents of the Colorado River System: bonytail (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), and razorback sucker (*Xyrauchen texanus*) (USDI-FWS 2002). The bonytail, Colorado pikeminnow, humpback chub, and razorback sucker share similar habitat requirements and historically have occupied the same rivers. None of these fish species are likely to be found in streams within the DFPA, nor has critical habitat been established in Wyoming for any of these species (Upper Colorado River Endangered Fish Recovery Program 1999). However, the potential for project-related impacts to waters that feed into the Colorado River System warrant their inclusion in this document.

<u>Colorado Pikeminnow</u>. The Colorado pikeminnow is the largest member of the minnow family and occurs in swift, warm waters of Colorado Basin rivers. The species was once abundant in the main stem of the Colorado River and most of its major tributaries throughout Wyoming, Colorado, Utah, New Mexico, Arizona, Nevada, California, and Mexico. It was also known to occur historically in the Green River of Wyoming at least as far north as the City of Green River. In 1990, one adult

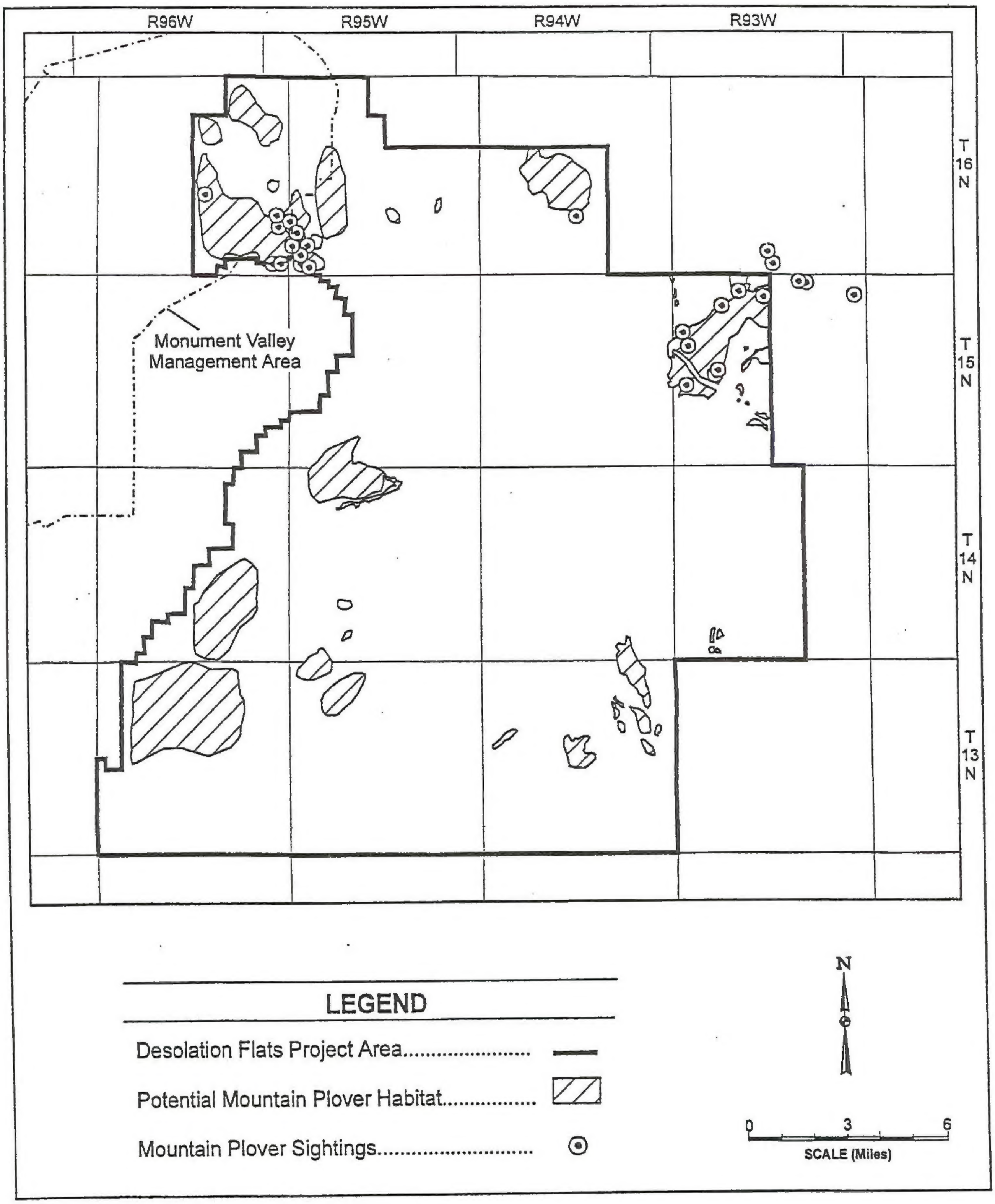

Figure 3-2. Areas Identified as Potential Mountain Plover Habitat and Mountain Plover Sightings on and proximal to the Desolation Flats Project Area.

was collected from the Little Snake River in Carbon County, Wyoming (Baxter and Stone 1995). Subsequent survey attempts to collect Colorado pikeminnow from this area of the Little Snake River by WGFD personnel failed to yield any other specimens.

Bonytail. Habitat of the bonytail is primarily limited to narrow, deep, canyon-bound rivers with swift currents and white water areas. With no known reproducing populations in the wild today, the bonytail is thought to be the rarest of the endangered fishes in the Colorado River System.

The bonytail was historically found in portions of the upper and lower Colorado River System. Today, in the upper Colorado River System, only small, disjunct populations of bonytail are thought to exist in the Yampa River in Dinosaur National Monument, in the Green River at Desolation and Gray canyons, in the Colorado River at the Colorado/Utah border and in Cataract Canyon (Upper Colorado River Endangered Fish Recovery Program 1999).

Humpback Chub. Habitat of the humpback chub is also limited to narrow, deep, canyon-bound rivers with swift currents and white water areas (Valdez and Clemmer 1982, Archer et al. 1985, Upper Colorado River Endangered Fish Recovery Program 1999).

The humpback chub was historically found throughout the Colorado River System, and its tributaries, which are used for spawning (Valdez et al. 2000). It is estimated that the humpback chub currently occupies 68% of its original distribution, in five independent populations that are thought to be stable (Valdez et al. 2000).

Razorback Sucker. The razorback sucker, an omnivorous bottom feeder, is one of the largest fishes in the sucker family. Adult razorback sucker habitat use varies depending on season and location. This species was once widespread throughout most of the Colorado River System from Wyoming to Mexico. Today, in the upper Colorado River System, populations of razorback suckers are only found in the upper Green River in Utah, the lower Yampa River in Colorado and occasionally in the Colorado River near Grand Junction (Upper Colorado River Endangered Fish Recovery Program 1999).

3.3 Plant Species

Ute ladies'-tresses. The Ute ladies'-tresses is a perennial, terrestrial orchid, endemic to moist soils near wetland meadows, springs, lakes, and perennial streams. It occurs generally in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows at elevations from 4,200 to 7,000 feet. The orchid colonizes early successional riparian habitats such as point bars, sand bars, and low lying gravelly, sandy, or cobbly edges, persisting in those areas where the hydrology provides continual dampness in the root zone through the growing season. Recent discoveries of orchid colonies in Wyoming and Montana indicate that surveys for and inventories of orchid occurrences continue to be an important part of orchid recovery planning and implementation (USDI-FWS 2002). This species has been located in Converse, Goshen, Laramie, and Niobrara counties in Wyoming (Fertig 2000).

4.0 Direct and Indirect Impacts of the Proposed Project

The spacing of well locations within existing natural gas production fields of the DFPA varies from one to a maximum of four per section. Currently most existing fields have one well location per section with a potential of 4 well locations per section. The Operators anticipate that future development in the DFPA will likely be concentrated within and near these existing fields.

Additional exploration and delineation drilling would continue to occur in the DFPA where production is currently not established.

Some surface locations within the DFPA may not be feasible to occupy, either for economical (e.g., high road construction costs), physical (e.g., steep terrain), or other environmental reasons (e.g., greater sage-grouse lek). Operators may use directional drilling to access bottom-hole locations in these areas (single-well pad with multi-well, directional drilling). The multi-well single pad design provides for construction of one well location with as few as two or as many as eight wells drilled from a central location.

The precise number of additional wells, locations of the wells, and timing of drilling associated with the proposed natural gas development project would be directed by the success of development drilling and production technology and economic considerations such as the cost of development of leases within the project area with marginal profitability. Although the total acres of wildlife habitat that would be disturbed under the Proposed Action or Alternative A over the next twenty years is known, the distribution of this disturbance will not be known until actual well locations are determined. Therefore, in order to assess the direct and indirect impacts of the proposed project, it was assumed that any section of land may potentially be developed at the level of 4 locations per section under both action alternatives.

4.1 Proposed Action

Under the Proposed Action approximately 4,923 acres of wildlife habitat would be sequentially disturbed over the next 20 years. However, with concurrent reclamation of disturbed habitats the total un-reclaimed disturbance area at any given point in time would never equal the sequential total of 4,923 acres.

4.1.1 Wildlife Species

Black-footed Ferret and Associated White-tailed Prairie Dog Colonies. Prairie dog colonies occur in portions of 67 sections within the DFPA and cover a total of 9,486 acres. All prairie dog colonies identified on the DFPA were located within 2 complexes. These complexes meet requirements for consideration as black-footed ferret habitat (Biggins et al. 1989). Development of the Proposed Action will likely result in direct disturbance of some portions of these prairie dog colonies within complexes. In order to avoid potential impacts to black-footed ferrets, surveys for the species will be conducted prior to disturbance of prairie dog colonies within the 2 complexes which meet the habitat requirements for black-footed ferrets (Biggins et al. 1989). If black-footed ferrets are found, no project related disturbance will occur within the prairie dog complex, consultation with the FWS will be initiated, and all previously authorized project related activities on-going in such towns or complexes shall be suspended immediately. The FWS will be notified within 24 hours if a black-footed ferret or their sign is observed. If the prescribed avoidance measures (listed in the *Coordination Measures* section) are applied, impacts to this species are unlikely to occur.

Canada Lynx. Canada lynx habitat is not present on the DFPA, and this species is not likely to be present. Therefore, implementation of the Proposed Action is not expected to impact the Canada lynx.

Bald Eagle. No bald eagle nests are known to occur on the project area, and WOS records (WGFD 2000) indicate that the project area is used only occasionally by this species, primarily

during the winter months (November through March). Winter concentration areas and/or winter night-time roosts are not known to exist on the DFPA. Suitable winter roosting habitat does not exist on the DFPA.

The southern portion of the project area, closest to the Little Snake River, has the highest potential for bald eagle occurrence. This portion of the DFPA contains crucial winter range for elk, mule deer, and pronghorn. The potential for vehicle collisions with big game would increase as a result of increased vehicular traffic associated with the presence of construction crews and activities in the project area. Because bald eagles commonly feed on carrion, particularly during the winter months, the presence of road-killed big game carcasses on and adjacent to the access roads is an attractant. Eagles feeding on these carcasses are in danger of being struck by moving vehicles. Any increase in the death rate of bald eagles from vehicular collisions will constitute a significant impact. Because the potential for an increase in the incidence of big game-vehicle-eagle encounters exists, measures to avoid and/or reduce such incidents will be taken. Such measures shall include: (1) requirement that regular drivers undergo training describing the circumstances under which vehicular collisions with bald eagles are likely to occur and the measures that can be employed to minimize them, including reduced speeds, (2) prohibition of unnecessary off-site activities of operational personnel and inform all project employees of applicable wildlife laws and penalties associated with unlawful take and harassment, (3) removal of vehicle-killed carcasses from the ROW's of access roads on the project area to eliminate the exposure of carrion-feeding eagles to the threat of being struck by vehicles, and (4) operators will internally enforce existing drug, alcohol, and firearms policies. Given the implementation of these measures, no adverse effects to bald eagles are expected.

<u>**Mountain Plover.**</u> Mountain plovers are present within the DFPA (see Figure 3-2). Potential mountain plover habitat covers approximately 25,415 acres within the DFPA. If disturbance is proposed within the mountain plover habitat located in these sections, the following measures will be taken to ensure that any potential impacts to mountain plovers are avoided. No disturbance will occur within mountain plover nesting habitat from April 10 - July 10. Mountain plovers often nest near roads, feed on or near roads, and use roads as travel corridors (USDI-FWS 1999), all of which make the species susceptible to being killed by vehicles. Thus, the operators shall warn employees about the potential for roadside and roadway use by the species. The amount of travel done at night and driving speeds will be minimized to reduce the potential for roadkill of mountain plovers in accordance to the Coordination Measures in Section 6.0. Implementation of Alternative A is not likely to jeopardize the mountain plover. However, there is a potential for impacts to individuals of this species. In the event the species is listed, formal consultation will be necessary.

4.1.2 Fish Species

Four federally endangered fish species were historically found within the Colorado River System, downstream from the DFPA: Colorado pikeminnow (*Ptychocheilus lucius*), bonytail (*Gila elegans*), humpback chub (*Gila cypha*), and razorback sucker (*Xyrauchen texanus*) (USDI-FWS 2002). All four of these fish species share similar habitat requirements and historically occupied the same river systems. Declines in their populations are mainly attributed to impacts of water development on natural temperature and flow regimes, creation of migration barriers, habitat fragmentation, the introduction of competitive and predatory non-native fishes, and the loss of inundated bottom lands and backwater areas (Minckley and Deacon 1991, USDI-FWS 1993). Perennial waters are not present within the DFPA, however Sand Creek may flow during wet years. This limited amount of water likely precludes potential for the occurrence of the four species of endangered fish endemic to the Colorado River System. These fish species may potentially occur in the Little Snake River,

a tributary of the Colorado River System, on a seasonal basis for spawning and/or rearing. Currently, critical habitat for these species has not been designated in Wyoming (Upper Colorado River Endangered Fish Recovery Program 1999), however, the potential for project-related impacts to these tributaries in the Colorado River System warrant their inclusion in this document.

The intermittent and ephemeral surface waters and shallow ground water on the DFPA could be impacted if process fluids or poor quality ground water used for industrial purposes were accidentally released. The design of facilities as closed systems and the confinement of storage tanks by berms will, however, minimize the potential for spills. Potential impacts to surface and shallow ground water would be minimized by these precautions.

The construction of roads, drill pads, and surface facilities could produce an increase in stream flow and a decrease in water quality in Sand Creek by decreasing the infiltration of water into the soil and creating the potential for increasing surface runoff, erosion, and off-site sedimentation. The stream flow and sediment load of Sand Creek are not likely to be significantly affected, however, because: (1) drainages are intermittent or ephemeral, (2) the topography of the DFPA is relatively gentle, (3) mean annual runoff is low due to the dry climate, (4) natural sediment loads are high and water quality is poor (USDI-BLM 2002), (5) all appropriate sediment and erosion control measures identified in the DEIS (USDI-BLM 2002) will be taken.

Average annual water usage with the Proposed Action is estimated at 29.1 acre-feet per year. This level of depletion is well below the level of 100 acre-feet per year that would require formal consultation with the FWS. It is not known if water used from wells within the DFPA is hydrologically linked to the Colorado River system. Regardless, water depletion will not be great enough to negatively impact the endangered fish of the Colorado River System, and formal consultation will not be required.

4.1.3 Plant Species

<u>Ute ladies'-tresses.</u> The Ute ladies'-tresses is not expected to occur on or near the DFPA due to the following reasons: (1) The DFPA is very arid and perennial streams are not present, (2) the elevation of the project area is near the upper limit for the species, (3) moist riparian area meadows are not present, (4) perennial streams are not present, (5) the transition from stream margins to upland vegetation is abrupt, and (6) the species has only been located in eastern and southeastern Wyoming (Fertig 2000). Therefore, implementation of the Proposed Action is not expected to impact the Ute ladies'-tresses.

4.2 Alternative A

Under Alternative A approximately 7,582 acres of wildlife habitat would be sequentially disturbed over the next 20 years. However, with concurrent reclamation of disturbed habitats the total un-reclaimed disturbance area at any given point in time would never equal the sequential total of 7,582 acres.

4.2.1 Wildlife Species

<u>Black-footed Ferret and Associated White-tailed Prairie Dog Colonies.</u> A greater number of sections within the DFPA with prairie dog colonies would be disturbed under Alternative A than the Proposed Action. Under both alternatives, the same measures will be applied to all areas of suitable black-footed ferret habitat that may be disturbed. The potential for impacts to black-footed

ferret habitat (i.e. white-tailed prairie dog colonies) will be greater under Alternative A due to the increased disturbance that will occur, but given the application of the prescribed avoidance measures (listed in the *Coordination Measures* section), impacts to this species are unlikely to occur.

Canada Lynx. The analysis for Alternative A is identical to that previously described under the Proposed Action.

Bald Eagle. The analysis for Alternative A is identical to that previously described under the Proposed Action.

Mountain Plover. A greater number of sections within the DFPA containing mountain plover habitat would be disturbed under Alternative A than the Proposed Action. Under both alternatives, the same measures will be applied to all areas of potential mountain plover habitat that may be disturbed. The potential for impacts to mountain plovers will be greater under Alternative A due to the increased disturbance that will occur. Implementation of Alternative A is not likely to jeopardize the mountain plover. However, there is a potential for impacts to individuals of this species. In the event the species is listed, formal consultation will be necessary.

4.2.2 Fish Species

The analysis for Alternative A is identical to that previously described under the Proposed Action except that water usage would be incrementally higher than under the Proposed Action, but still well below 100 acre-feet per year.

4.2.3 Plant Species

The analysis for Alternative A is identical to that previously described under the Proposed Action.

4.3 Alternative B - No Action

Under the No Action Alternative, the Proposed Action would not be implemented and further drilling would be allowed on federal lands only to the extent that it would be within the scope of existing environmental analyses. Individual APD's would be approved on a case-by-case basis. Wildlife and vegetation resources would continue to be impacted as individual APD's are granted by the BLM, and overall impacts may be similar to those described above. In terms of magnitude, such impacts would likely be less than for the Proposed Action. However, there would be an increased probability of occurrence of unexpected adverse impacts since overall field development would not happen in a well-planned and monitored manner.

5.0 Cumulative Impacts

The cumulative impact analysis (CIA) approach is used to evaluate the influences of recent, past, present, and reasonably foreseeable future human developments on the local wildlife resources. This approach examines impacts associated with a proposed project in context with all other past and future developments, whether or not they are related. It also allows the wildlife manager and land management agency to evaluate impacts on a broader scale. However, one of the inherent problems associated with CIA is that there are no definable limits as to the exact boundary or size of the geographic area to be considered. The BLM recommends evaluating cumulative impacts on a watershed basis for natural resources related to watershed function and stability. However,

with special concern wildlife and plant species, there are no clear, definable limits as to the most appropriate area to be considered in CIA. Moreover, complete information on the distribution, population levels, and habitats of specific species of concern is lacking and most accounts of these species are incidental in nature.

Existing disturbance within the DFPA is approximately 1,506.4 acres, or around 0.6 percent of the 233,542 acres comprising the project area. During the construction phase, the Proposed Action would disturb 4,923 acres and Alternative A would disturb 7,582 acres. Under Alternative B (No Action) additional surface disturbance would occur on a case-by-case basis. Disturbance areas within the DFPA will be reduced upon reclamation of pipeline ROW's, unused portions of the drill pad, portions of roads, and ancillary facility disturbances during the production phase for each alternative. Under the Proposed Action, reclamation will reduce impacts to 2,139 acres for a total impact of 3,645.4 acres or 1.6 percent of the DFPA. Alternative A impacts would decrease to 3,300 acres, with total impacts affecting 4,806.4 acres or about 2.1 percent of the DFPA.

Black-footed Ferret and Associated White-tailed Prairie Dog Colonies. Provided that avoidance measures outlined in this document are followed, the potential for an incremental increase in cumulative impacts due to the implementation of the Proposed Action and alternatives will be unlikely for the black-footed ferret.

Canada Lynx. Suitable habitat for the Canada lynx is not present on the DFPA, therefore implementation of the proposed project will not contribute to cumulative impacts upon the Canada lynx.

Bald Eagle. Bald eagles are not known to nest on the DFPA, but may use portions of the project area, especially during winter months when carrion is available. Provided that avoidance measures outlined in this document are followed, the potential for an incremental increase in cumulative impacts due to the implementation of the Proposed Action and alternatives will be unlikely for bald eagles.

Mountain Plover. Mountain plovers are present on the DFPA, and the surrounding areas. The incremental increase in cumulative impacts due to the implementation of the Proposed Action and alternatives may result in increased loss of mountain plover nesting habitat. However, the impacts of this potential habitat loss on mountain plover productivity and/or numbers is not currently known. It is anticipated that development associated with natural gas well pads, roads, and pipelines does not adversely impact mountain plover populations because mountain plovers prefer habitat with abundant bare ground and very low growing vegetation (Knopf 1996). Disturbed areas may actually meet these requirements for mountain plovers in the short term (Day 1994). These potential added impacts to mountain plover habitat are not expected to negatively impact the mountain plover population in the region.

Fish Species. Cumulative impacts upon the 4 endangered fish species that are downstream residents of the Colorado River System are not expected given that average annual water usage will be much lower than 100 acre-feet per year.

Plant Species. Suitable habitat for the Ute ladies'-tresses is not present on the DFPA, therefore implementation of the proposed project would not contribute to cumulative impacts upon this species.

6.0 Coordination Measures to Avoid or Reduce Adverse Impacts

The following procedures will be implemented to eliminate or substantially reduce potential adverse effects of the proposed project to special status species occurring in the vicinity of the DFPA.

6.1 Wildlife Species

- If disturbance of prairie dog colonies located within complexes that contain potential black-footed ferret habitat (Biggins et al. 1989) can not be avoided, black-footed ferret surveys will be conducted according to FWS guidelines (USDI-FWS 1989).

- Well pads and disturbances shall be placed (50 m) outside of prairie dog colonies where feasible.

- Should black-footed ferrets be documented in a prairie dog complex located within the project area, impact to the species or its habitat will be completely avoided, and all previously authorized project-related activities on-going in the prairie dog complex shall be suspended immediately.

- The BLM and operators shall conduct educational outreach to employees regarding the nature, hosts, and symptoms of canine distemper, and its effects on black-footed ferrets, focusing attention on why employees should not have pets on work sites during or after hours.

- All suspected observations of black-footed ferrets, their sign, or carcasses on the DFPA, however obtained, shall be promptly (within 24 hours) reported to the BLM and FWS.

- Where construction within potential mountain plover habitat is scheduled to occur between April 10 and July 10, mountain plover surveys will be conducted according to current FWS guidelines.

- Well pads and disturbances shall be placed outside of potential mountain plover habitat where feasible.

- Should mountain plovers or mountain plover nests be found within 200m of a proposed well or disturbance area, construction activities will be postponed until at least 1 week post hatching, and the site will be monitored during the following nesting season to determine whether or not the plovers return.

- All drivers shall undergo a training session describing the type of wildlife in the area that are susceptible to vehicular collisions in order to reduce the potential for vehicle-big game collisions and subsequent jeopardy to bald eagles feeding on road-killed carrion. The circumstances under which such collisions are likely to occur, and the measures that could be employed to minimize them shall be discussed. Reduced speed limits shall be implemented to reduce potential for vehicle-wildlife collisions.

- Carcasses shall be removed from access roads, shoulders, and the ROW's to minimize bald eagle exposure to vehicles.

In addition to those listed above, some of the following mountain plover protection measures may be implemented following consultation between the BLM, operators, and FWS if mountain plover occupied habitat areas are to be disturbed:

- To protect the identified mountain plover occupied habitat area, the proposed activity would not be allowed as proposed. An alternative such as moving the facility, directional drilling, piping and storage of condensate off the identified mountain plover occupied habitat area to a centralized facility, or other technique for the minimization of ground disturbance and habitat degradation would be required.

- To protect the identified mountain plover occupied habitat area, the proposed facility would be moved ½ mile from the identified occupied habitat area.

- To protect the identified mountain plover occupied habitat area and because mountain plover adults and broods may forage along roads during the night, traffic speed and traffic volume would be limited during night-time hours from April 10 to July 10.

- Within ½ mile of the identified mountain plover occupied habitat area, speed limits would be posted at 25 mph on resource roads and 35 mph on local roads during the brood rearing period (June 1 - July 10).

- The access road would be realigned to avoid the identified mountain plover occupied habitat area.

- To protect the identified mountain plover occupied habitat area, traffic would be minimized from June 1 - July 10 by car-pooling and organizing work activities to minimize trips on roads within ½ mile of the mountain plover occupied habitat area.

- To protect the identified mountain plover occupied habitat area, work schedules and shift changes would be modified from June 1 - July 10 to avoid the periods of activity from ½ hour after sunset to ½ hour before sunrise.

- To protect the identified mountain plover occupied habitat area, fences, storage tanks, and other elevated structures would be either constructed as low as possible and/or would incorporate perch-inhibitors into their design.

- Road-killed animals would be promptly removed from areas within ½ mile of the identified mountain plover occupied habitat area.

- To protect the identified mountain plover occupied habitat area, seed mixes and application rates for reclamation would be designed to produce stands of sparse, low-growing vegetation suitable for plover nesting.

- To minimize destruction of nests and disturbance to breeding mountain plovers, no reclamation activities or other ground-disturbing activities would occur from April 10 - July 10 unless surveys consistent with the Plover Guidelines or other FWS approved method find that no plovers are nesting in the area.

- A plugged and abandoned well within ½ mile of the identified mountain plover occupied habitat area would be identified with a marker 4 feet tall with a perch inhibitor on the top of the marker.

6.2 Fish Species

- All appropriate sedimentation and erosion control measures included in the Record of Decision for this project will be implemented to avoid reduction of water quality or quantity in the ephemeral streams of the DFPA that drain into the Colorado River System.
- Construction equipment fueling and servicing areas shall be located at least 150 feet from surface waters and riparian zones and away from slopes that lead to those zones.
- High construction standards and rigid safety precautions that adhere to approved design criteria to minimize the potential for an accidental spill or discharge of any chemical or petroleum product into surrounding watershed systems shall be implemented.
- As a safety measure, buffer zones of undisturbed vegetation along water courses shall be maintained to inhibit the transport of potentially contaminated runoff to surface waters.

6.3 Plant Species

- No additional measures would be required because habitat for the Ute ladies'-tresses is not present within the DFPA.

7.0 Effects of the Project on Expected Status of Species in the Future

Provided that the coordination measures described above are implemented, the proposed project is not expected to alter the current status of, or result in any decreased survival of, any of the listed species during the project or after project completion.

8.0 Determination of Effects to Threatened, Endangered, and Proposed Species

Black-footed Ferret. Based upon the analyses of the proposed project, the current and potential status of the species in the project area, other land use activities in the area, and incorporation of the coordination measures recommended in this BA, it is concluded that implementation of the Proposed Action, Alternative A, or Alternative B is not likely to adversely affect the black-footed ferret.

Canada Lynx. Based on the lack of suitable habitat in the project area it is extremely unlikely that lynx would occur on the DFPA. Therefore, the proposed project is not likely to adversely affect the Canada lynx.

Bald Eagle. Based upon the analyses of the proposed project, the current and potential status of the species in the project area, other land use activities in the area, and incorporation of the coordination measures recommended in this BA, it is concluded that implementation of the Proposed Action, Alternative A, or Alternative B is not likely to adversely affect the bald eagle.

Mountain Plover. Based upon the analyses of the proposed project, the current and potential status of the species in the project area, other land use activities in the area, and incorporation of

the coordination measures recommended in this BA, it is concluded that implementation of the Proposed Action, Alternative A, or Alternative B is not likely to jeopardize the mountain plover. However, there is a potential for impacts to individuals of this species. In the event the species is listed, formal consultation will be necessary.

Colorado River Fish. Based upon the analyses of the proposed project, the current status of these species in the Colorado River System, other land use activities in the area, and incorporation of the coordination measures recommended in this BA, it is concluded that implementation of the Proposed Action, Alternative A, or Alternative B is not likely to adversely affect endangered fish of the Colorado River System.

Ute ladies'-tresses. Based on the lack of suitable habitat in the project area it is extremely unlikely that Ute ladies'-tresses would occur on the DFPA. Therefore, the proposed project is not likely to adversely affect the Ute ladies'-tresses.

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